

Open Educational Resources and Informational Ecosystems

«Edutags» as a connector for open learning

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Abstract

Teaching and learning in school essentially relies on analogous and digital media, artefacts and tools of all kinds. They are supported and provided by various players. The role of these players for providing learning infrastructures and the interaction between them are discussed in the following paper. Increasingly, Open Educational Resources (OER) become available and the question arises how the interaction between these players is impacted. On the one hand, some players implement closed informational ecosystems that might provide a rich and coherent environment for learning, but also lock the users into a defined and often restricted environment. On the other hand, other players are interested in developing an infrastructure that supports open learning without the boundaries of closed informational ecosystems. Such open informational ecosystems must provide interconnections to numerous, in principal, unlimited number of platforms for learning contents. In the context of the project «Edutags» a reference platform is being implemented by way in which the contents of various providers are being connected and enriched through user-generated tags, commentaries and evaluations. The discussion points out that such an independent reference platform, operated separately from content platforms, must be considered as an important element in an open and truly distributed infrastructure for learning resources. Hence, we do not only need open educational resources to support open learning, we also need to establish an open informational ecosystem that supports such approaches.

Background

In the cooperation project «Edutags» the Learning Lab of the University Duisburg-Essen is, together with the Deutsches Institut für Internationale Pädagogische Forschung (DIPF = German Institute for International Pedagogical Research), developing a reference platform for teaching and learning resources that is to be deployed in the context of the German Education Server (Heinen and Bles 2011). The question is thereby raised as to the functions such a platform might have for teaching and learning in schools and how this may be embedded in the landscape of the different kinds of platforms and applications that are required for the scholastic use of teaching and learning resources.

The starting point for the conception of «Edutags» as a «social bookmarking» tool was an analysis of the interaction of the platforms and players that are necessary in order to make teaching-learning materials extensively available. In this context, the significance of a **reference platform** became evident when educational resources are to be operated as an open information ecosystem in association with a number of other platforms and players. Furthermore, it became clear that the availability of open educational resources alone is not sufficient to provide an appropriate environment for the sustainable use of these materials for teaching and learning in schools. We need to look more broadly at the informational ecosystem and how this informational ecosystem supports the use of open educational resources. Thus, we do not only need more open educational resources to support open learning, we also need to provide an open informational ecosystem that supports these approaches.

The following article presents the results of an analysis of the interaction between platforms, and contrasts the conditions of usage of learning materials in closed as opposed to open ecological systems. It thereby tries to reach beyond analyses that have described and examined single platforms for teaching materials (Gaiser, Hesse, and Lütke-Entrup 2007, Kos et al. 2005, Petko 2010). The concept of the reference platform «Edutags» is outlined and what it has to offer as a go-between for establishing an open ecological system of educational resources is described.

Conditions for the use of learning resources

As a starting point for the planning of a reference platform, the question was looked into as to how teaching staff find educational media and teaching materials for their lessons, how they prepare such materials for their lessons, as well as the nature of obstacles with which they encounter. To this end, the technique of working with focus groups was often applied in the course of the project. The focus group method proffers itself as the platform «Edutags» is still in development. The requirements and appraisals of the target group may thus be easily integrated into the development process (Morgan 1997). The members of the focus groups were chosen by taking a number of different aspects into consideration. The groups were made up both of regular teaching staff who considered themselves to have an affinity for digital media, and of teachers who act as didactical advisors either in schools or of expert groups. The teachers were joined by persons working in various phases of teacher training and future teachers currently being trained at college and in seminars for teacher training.

In the focus groups it became evident that teaching staff spend a considerable portion of their preparation time looking for materials of various kinds for their lessons. Teachers wish to find possible resources quickly and easily that (a) are suitable for their intended purpose and have, as far as possible, been «tested»

so that they may be certain of being able to make use thereof in their lessons, (b) without any legal concerns and (c) without any additional costs.

These three requirements will be illuminated below in more detail. The first aspect addresses the question of quality and quality assurance in connection with teaching resources, the second deals with legal questions, and the third relates to costs and thus to business models by way of which teaching resources are made available to schools.

Quality and quality assurance

In the case of the traditional school textbook, quality assurance is impacted by a combination of measures. It arises, in close connection with teaching timetables and curricula, mostly within a team of authors who are supervised by an editorial office. Moreover, most of the Federal States in Germany have an approvals procedure for educational works. Educational works, as defined in these approval procedures, are textbooks that are oriented towards teaching plans or standards of a school subject. Deployable as a key medium in lessons, they encompass teaching materials for an entire school (half-) year (cf. Stöber 2010, 5). These approval procedures fundamentally do *not* relate to supplementary teaching and learning materials; digital media in particular are explicitly excluded from the inspection process as a general rule. Whilst some Federal States implement detailed evaluation procedures, other States deploy simplified procedures in which the assurance given by a publisher to the fact that its materials conform to the required standard is sufficient. A number of Federal States in the meantime – for different reasons – entirely dispense with the approval of school textbooks (Stöber 2010).

Focus groups show that the textbook is highly appreciated by the various players. It offers teachers and students alike a rapid and simple guide as to what is to be taught or learnt respectively. It symbolises the amount of material to be covered in the course of a school year; learning progress is made tangible by counting the pages and chapters covered. It simplifies coordination between teaching staff who are involved in the same subject at the same level. And finally, procedures for the approval of «official» school books have been an instrument for the educational administration to enforce state-wide standards and curricula (Oelkers and Reusser 2008).

The increasing availability of worksheets and books, educational programmes and websites on the Internet is putting the importance of the textbook into perspective, however. In the initial phases of some projects, central educational servers have been brought forward that categorise and evaluate teaching resources extensively by editorial teams. This has essentially evolved to two procedures: educational servers adopt materials from providers of whom it generally assumes have

suitable or high quality materials at their disposal without any further examination. This corresponds to the «simplified procedure of textbook approval», without inspection that increasingly is being applied in various German states. In other cases, web resources are carefully gathered by a teacher or group of teachers on selected educational topics. Such compilations cover areas of a subject and do not raise any claim to completeness in the way in which a textbook covers the material for a school year.

A comprehensive evaluation of Internet resources for school lessons, for example on the basis of a catalogue of criteria, is to be regarded as misleading in view of the plethora and dynamism of the Internet. There are, moreover, doubts as to whether such a quality inspection would achieve results that are helpful to the teacher and say something meaningful about the educational effect of the resources (cf. Biffi 2002). In general, it seems questionable if a particular teaching material may per se be assessed as being of «a high quality» for scholastic use. The educational quality or relevance of any material may not be determined on the basis of the material itself but can only be evaluated in its usage in the teaching-learning process, the central proposition of the didactical-design approach elaborated in Kerres (2013). A multitude of sources on the Internet have not been specifically developed as teaching or learning materials but may nonetheless be, for example, used as raw data, sources and authentic materials in lessons.

Alternative approaches for the quality assurance of learning materials arise when teachers (the users of the materials) themselves are included in the evaluation. This approach is applied in the reference platform «Edutags» and described in more detail in the following section. In the context of Web 2.0, mechanisms have been developed by means of which users may be actively involved in the evaluation of content and the collaborative development of knowledge (Kerres 2006). This approach is achieved by processes in which users themselves produce and deliver materials, provide tags and keywords and evaluate them. In the case of a larger number of users, it is also possible to provide information by way of indirect procedures that are based on user behaviour, e.g. it may be indicated which materials are called upon more frequently, and recommendations can be given as to which materials might also be of interest, as the system can deduce the similarity of materials from the behaviour of users. Editorial teams are still needed for the important task of intervening in case of incorrect allocation or questionable contents.

When teachers are looking for materials on the Internet they can quickly find many resources. They complain, however, that it is a tiresome and time-consuming process to find the *right* material from the huge amount there is to choose from. This process can be simplified if keywords and evaluations from other peers are provided with the materials («social tagging» or «social bookmarking»). Teachers

collect references to materials and furnish these with metadata which do not conform to a prescribed taxonomy but are given by the users as free keywords («folksonomy») (Marlow et al. 2006).

This context offers a new approach to quality assurance of learning materials that is based on users' inputs. As the number of users increases, a knowledge base is created which helps to retrieve learning contents more efficiently and increasingly find them more easily. The problem is that in the beginning, when only few users have provided tags and evaluations, the platform is not very informative for new users and, hence, a critical level of inputs provided must be ensured (Bertram 2009, Peters 2009).

Legal aspects

Many sources may be found on the Internet that may be used for learning and teaching purposes. At the same time many teachers are uncertain as to the framework conditions under which this is possible because not everything that may be found on the Internet may also be used in lessons. German copyright laws protect the owners of intellectual property and the rights they have in connection with the exploitation of their works. At the same time society's demand for free access to knowledge for educational purposes is to be honoured. In the case of schools, current copyright laws therefore have limits that allow teachers to copy parts of educational works and to pass them on to their pupils. The terms of use may, however, explicitly rule out making such copies available in *digital* form or on school servers (UrhG (*Copyright Act*) 52). Should a teacher wish that pupils work with digital materials, alter them, integrate them in works of their own, and make them available to others in digital form, many materials that are available on the Internet, even if they may be accessed by the learners free of charge, may simply no longer be used for legal reasons.¹

These legal framework conditions are a burden to many teachers, particularly as it is not easy for them to recognise which form of usage is allowed, and which is excluded in a specific case. It is not very practical when several pages of terms of use must be read through merely to determine the manner in which, for example, a worksheet may be used in a lesson. It is for this reason that, in the international discussion pursuant to educational materials the so-called «Creative Commons Licences (CC)» have been accepted as an instrument with the help of which

¹ The legal pointers on the State Educational Server of Baden-Württemberg could serve as an example of this: «The sites may only be copied for private usage and, inasmuch as no third party rights are affected, made available to the public for viewing and use in non-commercial educational institutions, thereby quoting the sources, to the extent to which this is justified in connection with the respective purpose and the pursuit of non-commercial purposes. Online-input, alterations or further-reaching, in particular commercial, usages are only permissible if prior written consent is granted.» This makes it clear: the contents may be used in lessons, but not posted online or altered in any way. It is assumed that online-input also includes usage of Learning Management Systems.

permitted usage variations may be communicated quickly and easily between producer and user. The CC-licences are made up of several components (e. g. usage demands the naming of authors must be forwarded under the same conditions, may not be processed, may not be distributed for commercial purposes) that the producer adds to the content by way of appropriate identifiers.

In addition to the CC-licences, other adapted licensing forms may be selected in order to characterise usage rights for teaching purposes. The terms of use of the Statistisches Bundesamt² (Federal Statistics Office) and of the online service for educational media of the media centres in NRW (EDMOND)³ are hereby cited as examples. The Federal Office allows (independently of the context) forwarding and copying, but reserves for itself the right to alter the data. EDMOND, on the other hand, also permits alteration and processing in the school context along with digital forwarding, but not the publication of these altered products. From their context both regulations are understandable. The two examples cited make it clear that web resources are not teaching contents per se. Whereas EDMOND's offer is directly aimed at educational institutions, the target group for the Federal Statistics Office is significantly larger. The data stored there only becomes educational material when used in lessons.

There is some controversy in the discussion about OERs as to the characteristics that qualify an Internet source to be categorized as an «Open Educational Resource.» First of all, the question is asked whether «raw data» are to be regarded as OER or whether a certain degree of didacticism is required in order to count as an OER (Bretschneider 2012). This in turn raises the question of whether materials that have been created outside the context of an educational institution may be described as OER (DIPF [German Institute for International Educational Research] 2013). And finally, a further matter of controversy is whether a certain type of licence is mandatory for «Open Educational Resources.» Is it sufficient simply to make these resources available free of charge or is the permission to process and publish the material again connected herewithin? Must commercial usage also be possible or may this be excluded? And, where and/or when does the usage of the resource in educational contexts represent commercial usage (Klimpel 2012)?

As it is possible to differentiate between web resources from the perspective of usage thereof a teaching/learning context is as follows:

- Contents that have been produced and published as teaching – learning material and are identified by way of a licence as OER
- Contents that have been produced and published as teaching – learning material and are furnished by their creator with an individually worded usage agreement that describes their possible usages in an educational context.

² <https://www.destatis.de/DE/Meta/Impressum/Impressum.html>.

³ <http://www.medienzentrum.schulministerium.nrw.de/Edmond/nutzungsrechte.htm>.

- Contents that have been produced and published as teaching – learning material and which have not been placed under a particular licence. To these, the limitations of the copyright laws apply.
- Contents that have not been produced and published as teaching – learning material but which are described by way of a generally comprehensible licence as free contents.
- Contents that have not been produced and published as teaching – learning material but which are subject to individual terms of use that clearly define the framework for that usage.
- Contents that have not been produced and published as teaching – learning material and which have not been placed under a particular licence. To these, the limitations of the copyright laws apply.

Thus the spectrum of «Open Educational Resources» is made clear, as well as the fact that a definition seems almost impossible: «Open Educational Resources» may only be defined as being resources that are available via the Internet freely (without any further obstacles) and may be retrieved by the users free of charge. The usage of a generally comprehensible licence according, for example, to the CC-licence, is thereby a considerable aid to usage in learning contexts, but cannot be phrased as a necessary condition for an OER. These must conform to the valid legal stipulations of a given country and should be simple to communicate. This also corresponds to the definition of OER that Atkins, Brown and Hammond (2007) provide.

It should also be taken into account that legal interpretations do, in part, fundamentally differ in different cultures and countries. For example, the release of a resource waiving copyright laws in the «public domain», possibly in the United States, is incompatible with German copyright laws. It was not until 2010 that a judgement passed according to which the CC-licences – in contrast to other forms of licences that one comes across in an international context – were considered compatible with German case law.⁴

Costs and business models

In the focus groups, members of the teaching staff express the concern that, in the context of the increasing commercialisation of the Internet, certain high quality teaching-learning resources may only be accessible in the future against payment potentially. It is important to teachers that they should be able to have access to «Open Educational Resources» (OER) for school.

Learning materials, as well as the educational infrastructure for learning, have always been financed by various players. School equipment, including networks, computers or beamers in Germany are mostly to guaranteed by the municipality. Textbooks,

⁴ Regional Court of Berlin, Ref. 16O 458/10 dated 8.10.2010.

which are primarily loaned to students, are also financed by the municipality; in most cases extra payments are to be made by parents.⁵ In addition, parents have to finance further materials of general use and exercise books for lessons, for example, those materials that accompany or supplement an «official» textbook. Opinions differ as to whether digital educational resources can be counted as an «official» textbook, structuring the lessons over a school year. Whereas in NRW only approved school textbooks are financed by the municipality, Thuringia also includes educational software that substitutes for traditional textbooks in its range of free teaching materials.⁶ Usage licences for media that are provided by way of a State educational server or a State video library or media centre are, generally speaking, financed by the state.

This makes it clear that there is a fundamentally mixed financing system for educational infrastructure and media in schools in Germany, as in in most other countries. Essentially, the crucial question in the discussion about «Open Educational Resources» is whether students should pay to use the medium or whether this use should be financed by others. The development, provision and quality assurance of educational resources is never free from costs. We may therefore also assume that in the future there will be a mixed financing system; the only open question remains as to who is to bear which parts of these costs and where the focus of state financing should lie in the future: still only on traditional textbooks or should it include other resources or elements of the educational infrastructure?

The choice of cost model has an impact on the pedagogical work. If payment relies on the frequency of the retrieval of materials («pay per click»), this would influence the planning of a lesson. A school or a teacher could, for example, be compelled to reduce the number of retrievals, if the quota of clicks that has been purchased has been used up. Cost models that rely on billing the individual access thereby do not appear particularly practicable, or, from a pedagogical point of view, particularly sensible in regard to learning and teaching in schools.

It would therefore appear far more expedient to develop material pools that teachers and students can access openly. In order to establish material pools as «Open Educational Resources», procedures are required as to how these resources can be produced and made accessible using funds that have been previously used for traditional textbooks. Teachers can and will help to build such a base of open learning resources by sharing their materials. Additionally and more importantly, the experience of publishers in producing materials of high quality can be used to implement a wide range of «Open Educational Resources.»

⁵ In NRW, for example, schools may pass up to one-third of the costs for textbooks on to the parents (§96SchulG (Schools Act) NRW).

⁶ Thuringian Decree on Educational Resources (ThürLLVor §12, Para.2).

We may summarise the results of the work with focus groups in the «Edutags» project as follows: Teachers have a high demand for quickly finding high quality educational materials on the Internet for teaching in an efficient manner. They use the materials in lessons mainly in paper form, but wish to make them increasingly available to their students digitally, if legal conditions are resolved, and if no additional costs are incurred by students or the school. They do not wish to be bound to individual providers but want to be open to various providers and to also make their own contributions to the further development of learning materials.

Digital Educational Resources as a Component of the Educational Infrastructure in schools

Digital educational infrastructures are increasingly complicated entities in which many components must necessarily interact with one another: from the furnishing of the buildings and the IT hardware components to applications and platforms that are operated by various commercial and state institutions. These components must be technically and conceptually compatible with one another in order to be able to be integrated effectively into the teaching–learning context. In addition, a number of services, from installation, maintenance and upkeep, to consultancy and training, are necessarily if these are to be used successfully (Kerres, Heinen and Stratmann 2012; Kerres and Heinen 2013).

School, Content and Reference Servers

Beginning with the analysis of the conditions for the usage of digital educational resources, the question is examined as to how an informational ecological system is to be shaped that corresponds to the requirements of scholastic teaching and learning. The concept of an «open informational ecological system» for educational resources has been thereby developed. It is based upon the idea of the interaction between various players and platforms that in the final analysis, provide the educational infrastructure. In the following discussion, school, content and reference platforms are examined as components of such an ecological system.

- School Platform

A teacher develops materials for his or her lesson or searches for materials on the Internet. He or she then posts these materials to a learning management system so that the students can use them. Learning management systems usually take the form of a school server run by the school itself or provided by a host (e.g. Moodle, Fronter, LoNet or similar provider). The school platform offers students a central location where they can find relevant documents for learning activities. School platforms serve the purpose of distributing learning materials. The students do not necessarily work with these materials «within» the school platform itself (Petko

2010). For this purpose, the students mostly use other tools in their personal learning environment (PLE). In this sense, learning management system are also to be regarded as social hubs that connect the PLEs of the students with the institutional platforms of the school (Hölterhof, Nattland and Kerres 2012; Kerres, Hölterhof and Nattland 2011).

- Content Platform

Teaching and learning materials are available on various platforms (in Germany e.g. Lehrer-Online, 4Teachers, ZUM, Educational Servers etc.). The contents are posted either by an institution, a publishing house, an editorial team or, even by users themselves (usually teachers). Generally speaking, metadata pursuant to the resources are entered in order to enable the materials (at least within the respective platform) to be found more easily. A number of different standards exist for these learning objects and metadata (Weibel 1998; IEEE 2002) that, despite intensive endeavours, (Van Assche et al. 2009) have not led to a uniform standard. There is also some criticism that these standards are not flexible enough and say little about the actual potentials of educational objects in classrooms (Brooks and McCalla 2009).

In any case, expenses are incurred for the operation and supervision of the platform, which can be collected differently depending on the business model. As has already been mentioned, the users themselves can cover the costs by an annual subscription (similar to a magazine) or they may «pay per page» similar to a loose-leaf binder, or the costs may be borne by another party, be it private parties or institutions that may be active on behalf of a school governing body or a Federal State. Some content platforms are operated e.g. by institutions, companies or associations.

These platforms can offer a wealth of materials for use in the classroom. Most often, they complement learning by way of an «official» textbook with exercise materials of all kinds. The «official» textbook contains a linear-structured and closed collection of didactically prepared material that is based on the curriculum for a school year and school type. An increasing number of publishers are producing digital textbooks that have a number of advantages when compared to traditional textbooks. For example, digital textbooks are often conceived as documents, for example, in PDF-format, provided for reading on a laptop or tablet. Then, searching and navigating is easier in a digital document; texts and images may be more easily annotated, managed and commented upon. Digital documents can also integrate multiple forms of multimedia and interactive exercises. Döbeli Honegger (2012) discusses the future potential for textbooks as a consequence of digitalisation.

Publishers are beginning to build online-platforms around their digital textbooks that are made available to classes and courses that work with particular textbooks. Increasingly, rich online-environments with diverse materials are being set up for this purpose. Teachers are provided with various presentations and templates for examinations and tests. If the print-based textbook is available in a digital format and finds its way to the Internet, the transition to other content platforms becomes blurred. The question remains as to the direction in which the digital textbook will finally develop, whether it will become a document with embedded and extended (multimedia) interaction or an online-platform with a multifaceted pool of materials and an online-learning environment for courses based on digital textbooks.

- Reference Platforms

With the diversity of available materials on the Internet the question is raised as to how teachers and their students can find materials for their learning activities. The first path will lead them to those search engines that they also use in their daily activities, which will presumably guide them to one of the above-mentioned content platforms for learning materials. Should they already be familiar with such a content platform they may possibly take the second path and search directly within the content platform itself. This type of search is restricted to materials on that platform or, to put it another way, it will be necessary for the teacher to conduct the search on a number of platforms consecutively. They may, however, also take the third path and search for materials on an educational platform that brings together references to materials to be found on a platforms of several providers. In this case, the reference platform merely *points* to materials on a content platform, but does not, as a rule, provide materials of its own.

Reference platforms may be filled with content in three ways:

- (1) Editorial Maintenance: An editorial team looks for materials on the Internet and posts references to these materials, usually furnishing them with keywords and / or allocating them to a taxonomy (e.g. according to school year and subjects). This corresponds roughly to the practice adopted by some state educational servers or the core service offered by the Federal Educational Server.
- (2) Automatic Aggregation: So-called «crawlers» comb their way through the resources on associated content platforms and register any newly posted materials. These crawlers analyse the contents and attempt to classify them automatically, or furnish them with keywords that may be extracted from their contents.
- (3) User-generated Content: The users themselves enter references to valuable educational materials, assess these and provide keywords. On the basis of previous search inquiries and keywords used, the platform is able to make recommendations for further materials.

Some states' educational servers are websites operated by editors, for example, that are supplemented by automatic aggregation. User-generated content often is to be found on websites that are run by teachers themselves. The German national educational server offers a mixed form. Alongside editorially maintained content one also finds – with «Edutags» – a reference system that points to educational resources provided by users. Finally, a crawler automatically reaches out to check the resource and reads available attributes of the resource, inasmuch as this is possible.

Interaction between the Platforms

To describe the full picture of a learning infrastructure platform, beyond school, content and reference platforms, repositories, portfolios or systems for assessment or administrative purposes should be included. In any case, it becomes evident that the successful and sustainable provision of educational resources beyond the scope of a single school is not a trivial matter: the mere posting of a resource on a server cannot guarantee that the materials, –often compiled with a great deal of effort, will be reliably found and integrated into classroom learning. There are several obstacles to be overcome from the production of a learning resource by a teacher including the uploading onto the «right» platform and the usage by another teacher in another school. (not sure I understand why the latter example is an obstacle?)

The complexity of this workflow can be reduced to some extent if the sub-processes described are brought together in a single platform or environment. This is the approach that is to be found in so-called «closed informational ecosystems» and which is outlined in the following discussion.

Open and closed informational ecosystems

The brief overview of platforms that come into play in the provision of resources for learning and teaching demonstrates the complexity of the informational infrastructure necessary for providing learning resources. These processes can technically be grouped together and implemented on a *single* platform or on an Internet environment (consisting of several components that are connected to one another), that is designed and controlled by one provider.

A publisher may, for example, operate a platform,

- on which teachers share links to contents,
- on which available content is uploaded,
- on which content is classified and tagged with keywords,
- on which content is reviewed and processed where necessary,
- on which other teachers search for content, comment and evaluate them and finally

- copy this content into a course shell in which
- students learn from these materials.

An approach of this kind can provide a coherent and uniform environment. From the provider's point of view, the environment can tie teachers and students to the platform. In such a closed environment, all aspects of the ecosystem can be controlled by a central agent, not only the contents, but also the hard- and software components for viewing and processing these contents. Such a «closed informational ecological system» for the provision of educational resources has far-reaching implications and social consequences beyond education and learning in schools. It is, finally, a question how the production and dissemination of knowledge should, could and must take place in an open society.

A closed environment of this kind can offer many advantages to the individual user. The «vendor lock-in» effect does, however, result in a dependency that is, perspectively speaking, problematic for a society that is dependent upon the free development of and access to knowledge. From the perspective of education such an aggregation of knowledge in «closed informational ecological systems» must be regarded as problematic. It can be seen as a significant cultural achievement that knowledge is available for education that belongs to everyone and that education, as a state duty and civil concern, is borne by everyone. The commercialisation of the Internet could bring a closure to knowledge platforms in the long term without the far-reaching effects and implications for the individual user being available in the short term.

Yochai Benkler (2002) coined the concept of «commons-based peer production. The origin of the Internet encyclopaedia revealed the possibilities that may be linked to a commons-based production of knowledge where individuals contribute to a work that is the property of «all.» However, in most cases there are a relatively few number of users that actively contribute and share their knowledge contrasted with a large amount of users who «consume» these resources and do not actively participate in the knowledge building.

Aigran (2012) refers to Doueïhi (2009) and a new form of «digital humanism» which feeds off three factors: a) already existing knowledge and infrastructures that are used and shared jointly, b) the ability of each individual to make a contribution to the pool of world knowledge, and c) tolerance to gaps in knowledge and lack of knowledge accompanied by the endeavour to compensate for this as much as possible. A commons-based peer production of knowledge must guarantee that each individual may make a contribution to the body of knowledge from anywhere, some tools and resources must be available for the functioning of the project, and it must be possible that the results of this process are available for others. (Aigran 2012).

The concept of open informational ecological systems can be directly derived from this. It is an environment that is open for a commons-based production of knowledge resources by peers, whereby the participation of commercial producers is not ruled out. In the context of projects such as Wikipedia, it also becomes clear that the provision of «open resources» does require a rather sophisticated technical and social infrastructure, as well as financial means.

«Edutags»: A Reference Platform for Educational Resources

In the following discussion, the significance of a reference platform as a basic technology for an open informational ecological system will be explained in more detail. «Edutags» is a reaction to the problems described above; it uses the assignment of keywords to educational resources as a measure of the quality assurance of these resources. Also, the importance of providing licence information for educational resources is highlighted.

Keywords for the Description of Educational Resources

«Edutags» contains a platform on which teachers create references to web resources of all kinds that they deploy in an educational context. Teachers describe these resources by way of keywords (tags) and other information. The choice of keywords is the prerogative of the users. Terms from a subject-specific list of keywords as well as other terms based upon individual criteria of a single person or group may be assigned. The decisive factor is that users, by way of assigning keywords, illustrate and reflect their own concepts pursuant to the resources (Kimmerle, Cress and Held 2010). These tags do not represent a complete set of metadata but do offer descriptions that relate to the actual use of the resource by a teacher in a «real-life» context. If several users assign keywords to a resource, the describing metadata becomes more substantial, and the resources can be found more easily by other users (Weinberger 2007; Ihme, Möller and Pohlmann 2009, Richter and Ehlers 2010).

In contrast to other reference platforms, it is possible in «Edutags» to store not only materials that have been explicitly defined as teaching materials, but also all other kind of materials, for example, from platforms like YouTube or Flickr. The important question is whether and how an Internet resource is used in a classroom context by a teacher who creates such a link to a resource.

Allocation of Synonyms and Classification within Hierarchies

A widespread problem with «free tagging» by users is that several keywords (tags) can be found for one concept or resource. This can make it difficult to find some resources and some valuable resources might remain undiscovered. Such a «folksonomy» is not aware of any relationships between the individual terms and

does not order them in a hierarchical structure like a taxonomy. Such a hierarchical structure, however, is very important, especially for school contexts. «Edutags» addresses both of these deficiencies: Synonyms are allocated to one another and to other keywords. Both of these measures contribute to an improvement of search results.

Identification of Licences

Teachers should immediately be able to recognise the legal conditions of how a certain resource may be used in their classroom. In the best case, this information is incorporated into the source code of an Internet resource so that this can be automatically deciphered by «Edutags.»

For each resource, «Edutags» checks the resource on the target platform to test whether a machine-readable licence is provided with the resource. In case a CC-licence is provided the appropriate licence tag and pictogram will be presented in the description of the resource. Furthermore, in order to raise the awareness of free materials and to give greater publicity to existing OER materials, providers of CC-licensed materials can input these materials to «Edutags» directly via standardised interfaces (RSS-Feed, Meta-Keywords according to LOM, LMR, or similar. In this way «Edutags» complies with demands made in the UNESCO Paris declaration (UNESCO 2012) and supports the Germany act (D'Antoni, 2009).

Interfaces to Use in Lessons

A teacher who compiles web resources as a result of a search inquiry on «Edutags» intends, as a second step, to make these resources available to students. To this end, «Edutags» offers four interfaces. Results lists may be issued as PDF files, printed out and distributed among students, they may be embedded as a tag cloud or list on websites and LMS or passed on as an RSS-Feed. These tag clouds and RSS-feeds do not only reflect current search results but are also dynamically generated and enhanced by information added at a future date. «Edutags» thus represent a link between various content platforms and content providers that may be used as educational material and the schools' learning platform. As a result, teachers profit from resources that have been shared by other teachers.

Summary and Conclusions

The analysis of the framework conditions for the use of educational resources in school contexts has revealed a number of aspects that are of particular concern to teachers. Teachers wish to be able to quickly access a large number of high quality (quality-assured) materials that they may use in their lessons free of charge and without any legal problems. At the next stage, the interaction between the players and their offers or platforms has been investigated. It was revealed thereby that

only an «open informational ecosystem» redeems the demands of approaches for open learning as well as other pedagogical criteria.

Our position is based on the observation that despite the availability of a vast amount of open and free resources for learning and teaching, closed informational ecosystems are currently affecting the development of open educational resources. Thus, we do not only need more open educational resources to support open learning, we also need to establish an open informational eco-system that sustainably supports strategies of open learning.

Our argumentation can be summarised as follows:

- Access to a multitude of digital educational resources is a pre-condition for learning in which the search for assessment and processing of digital information is an important component of learning. It is always of urgent necessity when it is a question of the individual and cooperative confrontation with knowledge from multiple perspectives in which the students make active constructive contributions.
- Digital educational resources may be made available for learning in various forms. They may be provided by commercial companies such as textbook publishers or developed and/or provided by private or state institutions.
- There are different types of licences with which digital educational resources may be used in schools. Some licences merely permit a reference to be made to a resource, others open up far-reaching possibilities of modifying and distributing a resource that has been processed. In the case of materials that have not been licensed the restrictions imposed by copyright laws take effect.
- «Open Educational Resources» is a term referring to educational materials that are available to teachers and students free of charge. This includes variants of different ranges within which they may be approved for use.
- CC-licences are an instrument which helps to easily communicate which usage variants have been granted pursuant to a specific educational resource. They are, however, not the only variant for the licensing of «open» educational resources.
- The compilation and distribution of educational materials is always connected with expenditure. In the case of «Open Educational Resources (OER)» it is essentially a matter of the students not paying for access themselves, but of another institution covering such costs. To this extent, the discussion of OERs is essentially concentrated on business and operating models for the provision of educational resources. Commercial providers may also provide OERs, if alternative ways of covering the costs are available.
- Closed informational ecological systems for educational resources provide content and offer schools a complete and (often) convenient environment for their teaching and learning activities. They are thus able to create a coherent

and consistent environment for learning, however, these systems offer little systematic exchange with external platforms and resources.

- Open informational ecosystems create an environment for community-based production of knowledge by peers, where resources and services of various players may be bundled together. Through exchange formats, interfaces and services, these ecosystems ensure that their platforms cooperate.
- Content is only turned into educational resources by active use in a teaching-learning context. The active participation of users in collecting, tagging and evaluating content, as well as providing metadata, are important means for quality assurance on the Internet.
- An essential component of an open informational ecological system is the availability of an independent reference platform that is open to all providers of content on the Internet. This should be managed by contributions from users, automatic searches and recommendation mechanisms, as well as from an editorial staff.
- Access to the diversity, dynamic, and the openness of knowledge is a central prerequisite of education. Open informational ecological systems in which various players and platforms are incorporated are an essential condition for future education in general. «Open Educational Resources» are thus dependent upon open informational ecosystems.

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