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Self-Reported Learning Effects of a Tagging Activity Carried out in a Personal Learning Environment (PLE) by Secondary-School Pupils

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Abstract

This paper reports on the use of a Web 2.0 artifact by sixteen 14/15 year-old pupils in a formal learning context. The gathered data provides a first appreciation of how the participants saw the action of tagging resources as affecting five dimensions of their learning experience: satisfaction, feeling of learning, effects on recall, effects on understanding and sense of personalization of the learning sequence. Based on these self-reported judgments, a discussion is opened on the mere decision to divert highly complex Web 2.0 tools into "ordinary" learning tools. The study also raises side questions about how pupils give an account of their learning experience and how they balance, or not, content and process aspects is such a description.

Keywords: tags, tag cloud, PLEM, Personal learning environment, Web 2.0, recall, meta-learning, judgment of learning, JOL, secondary school

1. A Web 2.0 artifact

Personal Learning Environments, widget technology, social software, all Web 2.0 artifacts promoting the bookmarking, tagging and sharing of resources, are gaining momentum [1, 2] and have even been portrayed as the future of education [3, 4]. However, their possible contribution to regular school instruction, remains unclear. This paper reports an attempt to incorporate a Web 2.0 artifact in a lesson. The artifact was developed by the University of Aachen. It is called PLEM (Personal Learning Environment Manager) [5]. While using this tool, students got acquainted with the tagging of the resources they found, that is with a common action conveyed and bolstered by the development of the Web 2.0.

1. Tagging resources

The term tagging is used to describe the labeling of resources found on the Internet by using free form key words – the tags. The tagging of resources, widely adopted by many social software services in the context of the Web2.0 [6], results in user-generated metadata. Along with tags have emerged "tag clouds". A tag cloud is a visual design that describes the content of a website by displaying the tags associated to his content and by representing their relative importance through the use of different colors or weighted font size (see Figure 1). As much as a table of contents can do for a book and a menu of categories can do for a website, tag clouds provide a visual means for users to form a general impression of the underlying set of content and a "gist" of what the site is about [7].

Figure 1. The PLEM tags cloud of a participant

A number of scientific contributions have focused on tagging as a type of community driven creation of meta-data [8, 9, 10], or have studied tags as a way to improve the accessibility of contents [11, 12].

Only a modicum of empirical studies specifically address the cognitive and learning effects of the action of tagging on individuals. De Smet, Van Keer, and Valcke [13] have argued that tagging of own actions with a pre-defined vocabulary supports peer tutor's meta-cognitive processes. Shergold, Davies, and Lamour [14] used a list of fixed keywords to help learners to identify own skills. Not considering reflection on the tagging action itself, these studies contrast with Glahn, Specht, and Koper [15] who studied the potential of tag clouds to capture personal learning history and to stimulate reflection in informal learning settings. They point out that personal tag clouds and the use of highlighted tags can stimulate reflection on the tagging activity of learners and help them to evaluate and to monitor the semantic structure of the resources that they have found on the web. Individual benefits of the tagging activity are also addressed by Budiu, Pirolli, & Hong [16] who observe contrasted effects of tagging-by-typing versus tagging-by-clicking on both recognition and recall tests for the original material.

The experiment presented here differs from these studies in that it combines the following attributes: (a) it takes place in a formal learning context, (b) it is set up in a secondary school, (c) it gives room to perceived contribution of tagging to generic skills acquisition (recall, understanding) and not only to externally scored performance.

2. Method

2.1. Context and assignment

The study took place in a "Catholic studies" class offered to pupils aged 14 to 15 at the European School Mol (Belgium). During a lesson of 45', they were asked to search for Web resources on an assigned topic (the Belgian missionary Father Damian), to add and tag these resources in their PLEM (Personal Learning Environment Manager) and to look at the evolution of their tags cloud.

2.2. The digital tool

PLEM is a rich tool providing facilities to qualify and orchestrate a personal collection of Web resources. It offers many functions (see Figure 2) and is underpinned by complex notions like "collective intelligence" and "long tail theory".

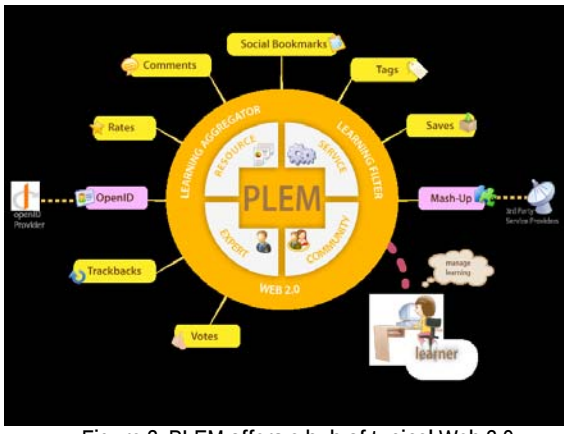

Figure 2. PLEM offers a hub of typical Web 2.0 functions.

A learner can log into PLEM and create a personalized space, where he can easily aggregate, manage, tag, rate, and share learning entities of interest. An example of such a space is depicted in Figure 3. As an aggregator, PLEM enables learners to pull together learning resources from more than one source, remix and assemble them to form a new and personal "learning collection". Learning collections are made available and easy to search and reuse by the PLEM community. In addition, PLEM offers a distributed voting mechanism to locate quality learning resources. Each qualifying action of a learning entity (e.g. comment, link, save, like, rate, vote, view, share) counts as one vote for that learning entity. The mean value of all votes for a given learning entity is then used to measure its popularity.

Figure 3. A participant's PLEM personal space for tagging, commenting, rating, sharing learning resources.

2.3. Tagging for learning

In the wealth of functions offered by PLEM, the lesson plan chosen for this study concentrates on the tagging activity. Pupils are requested to assign free-chosen keywords to the Web resources they found on the topic and to observe the evolution of their personal tag cloud. (Observations and questionnaires of this study bundle the tagging activity and the tag cloud follow-up. No specific effect of one or the other action are assessed).

In the realm of Web 2.0 research, tags and tag clouds are usually related to the so-called "social Web", stressing the fact that the resources and their qualifications can be shared with others. The assignment given here to pupils does not only drastically scope down the functions of PLEM, it also leaves out this social dimension. No mutual sharing of bookmarks, no comparison with peers' tags were included in the learning activity. Based on recent studies, this focus has a legitimacy of its own. Yet, Glahn [17] recently pinpointed that learners' main use of tagging and tag clouds was not "social" in the first place but initially guided by "cognitive management" needs of individuals. In the same vein, Panke & Gaiser [18] conducted two surveys to study the potential and limitations of social tagging as a tool for personal and collective knowledge management. They found that the use of tagging as a personal management tool was much more important to participants than using it as an information sharing tool.

2.3. Procedure

Pupils were introduced to the tool during a 20 minutes session just before the beginning of the lesson. After the lesson, pupils answered an evaluation questionnaire meant to ascertain aspects of their learning experience: overall appreciation of the instructional sequence, feeling of learning, perceived contribution of the learning activity to understanding and memorization and contribution of the PLEM-based activity to an enhanced personalization of the unit of learning.

2.2. Data gathering

Three methods were used to collect data.

2.2.1. Questionnaires. This type of data comes from participants' answers recorded through the online service Questback. The questionnaire comprised 23 questions (in four sections) meant to examine:

- pupils' appreciation of the task and its level of complexity;
- pupils' judgement of learning, viz. questions asking students to report the learning they believe they achieved as a consequence of having taken the lesson [19, 20];
- pupils' evaluation of the benefit that can be brought by the mere process of filling in a questionnaire [21] about their learning experience;
- pupils' understanding of PLEM and its functionalities.

Self-reported evaluations therefore provide the major part of the gathered data. This approach that takes "student's voice" as the main material for the investigation, was adopted for the following reasons:

- from a research perspective, it is important to achieve more objective evaluations of subjectivity [22, 23], especially regarding the acceptance and real use of new appliances;
- from an instruction perspective, asking for students' opinion upon the learning sequence they experience might be a (meta-)learning vehicle of its own right. In their work on "reflection amplifiers", seen as structured opportunities for students to examine and evaluate various aspects of their learning experience, Verpoorten, Westera, and Specht [24] describe learners' appreciation of the task, judgment of learning and other auto-cognitive and rating instruments as techniques to train reflection and self-awareness. The evaluation questionnaire was therefore presented to students as an integral part of the lesson;
- from a teacher/course evaluation perspective, McKeachie et Kaplan [25] express the viewpoint that students' estimation of their own learning, achievement of course goals, motivation for further learning, etc. are preferable to their evaluation of teacher or learning tools characteristics.

More generally, this article is part of a larger investigation process that positively takes what students can say about their learning experience as an object of study. Triangulations with more "objective" were nevertheless looked for.

2.2.2. Observation of the activity outputs. This second type of data comes from the analysis of participants' inputs in PLEM. By observing their tags and personal clouds, crosschecks with some subjective claims were inquired.

2.2.3. Analysis of a consequential task. As a final and integrative task, pupils were asked to write down a text about Father Damian from as many elements they learnt through the PLEM-based sequence as possible. There was a time limit of 4 minutes for this task. The outputs were analyzed.

3. Results

Due to the small size of the sample, results are sometimes given as raw figures.

3.1. Judgment of learning

"Judgment of learning" is defined as asking learners to report the benefits they believe they reaped as a consequence of having taken a course or a lesson. To the question "What have you learnt from the lesson?", two answers (both explicitly stated by the teacher in his introduction and both clearly visible in the assignment page received by all pupils) were expected: (a) expected answer 1 (concerned with content): "I learnt about the life of Father Damian" (the historical character to which the Web search was dedicated), (b) expected answer 2 (concerned with process): "I learnt about using a tool called PLEM and/or about tagging documents".

Results show that an overwhelming majority of pupils restrain their judgment of learning to content-related aspects (expected answer n°1). Only 3 pupils (19%) mention, besides content aspects, that they learnt to use a new tool or that they learnt to tag websites. A crosscheck of these ratios was organized with the reasons given by pupils for their level of satisfaction (see Figure 4) about their learning experience.

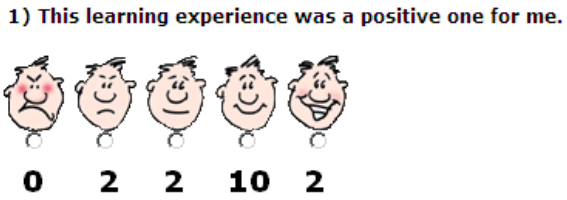

Figure 4. Two pupil claim to be very satisfied with the PLEM-based lesson, 10 satisfied, 2 indifferent, 2 not satisfied.

The same low proportion of pupils aware of a procedural learning (expected answer n°2) is found in these reasons. The two unsatisfied pupils give the complexity of the tool as a justification for non satisfaction. The two indifferent pupils do not give consistent answers, making reference to their experience of the whole course and not of the PLEM-based course. The 12 satisfied and very satisfied people motivate their rating by: (a) a feeling of learning about the assigned topic (5 answers), (b) the fact that such a lesson is different from regular lessons (5 answers), (c) a feeling of learning about the tool used (2 answer). Again, the portion of learning linked to processes (getting acquainted with a new tool and the action of tagging) is mentioned only by 2 (16,5%) satisfied/very satisfied pupils (one intersecting with the 3 "procedural pupils" in the previous question), despite its explicit mention and the massive presence of the new tool in the learning activity. It could be objected that the weak occurrence of the expected answer n°2 is due to a pre-existing knowledge of the tool. As they would already master this aspect of the learning experience, they would not mention it as new learning. Though no explicit question was settled thereabout, the knowledge of PLEM is quite doubtful due to its still experimental dimension and to its current cryptic address. Furthermore, one question bore upon pupil's current use of Web 2.0 affordances. Only one pupil out of 16 report a prior use of social bookmarking and none of tagging. Participants appear to be mainly anchored in a "book- culture", far from the portray of the "Generation X", "Net Geners", "Homo Zappiens", "digital natives" they are sometimes claimed to be.

3.2. Judgment on topic mastery

Before and after their work in PLEM, pupils were asked to assess their perceived level of mastery of the assigned topic. Pupils could choose between 4 levels of knowledge going from ignorance to a detailed knowledge. According to students, the PLEM-based learning activity resulted in learning gains (Figure 5).

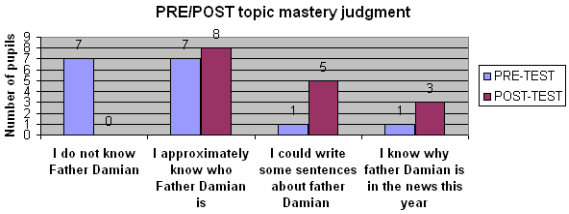

Figure 5. The group report learning progress.

3.3. Generic skills development

Since it is doubtful that Web 2.0 technologies will convince teachers without efforts to make explicit the competence these technologies are likely to train, the study collected appreciations of how the participants saw the action of tagging as affecting their understanding (see Figure 6) and memorization (see Figure 7), considered as generic or soft skills.

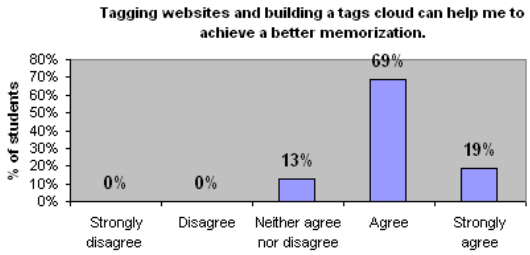

Figure 6. Pupils are affirmative about the positive impact of tagging on their memorization.

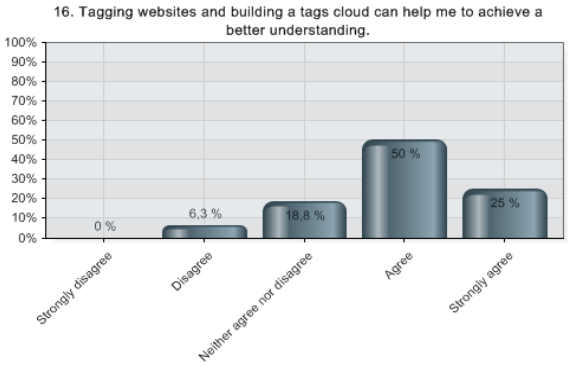

Figure 7. Pupils are affirmative about the positive impact of tagging on their memorization.

In an attempt to obtain objective confirmation of this positive relationship that pupils trace between tagging and memorizing, the final text produced by the pupils on the covered topic was analyzed. The words used in this text (column 3 in Table 1) were compared to the words used as tags (column 1 in Table1). Words used in both were supposed to be evidence of improved memorization. Hence, this approach did not give conclusive results. The only thing that can be said is that the words found in the final text have been used as tags (see Table 1).

Table 1. Comparison of tags and words in the final text.

	Tags on resources (in brackets, number of resources)	**Tags in the personal cloud**	**Words in the final text**
Pupil 1	**34 (3)**	**25**	**7**
Pupil 2	**12 (2)**	**12**	**6**
Pupil 3	**23 (4)**	**22**	**7**
Pupil 4	**7 (2)**	**6**	**3**
Pupil 5	**5 (1)**	**5**	**6**
Pupil 6	**16 (2)**	**14**	**10**
Pupil 7	**20 (3)**	**20**	**13**
Pupil 8	**11 (3)**	**10**	**4**
Pupil 9	**6 (1)**	**6**	**5**
Pupil 10	**15 (2)**	**10**	**5**
Pupil 11	**26 (4)**	**26**	**4**
Pupil 12	**38 (6)**	**16**	**13**
Pupil 13	**13 (2)**	**10**	**4**
Pupil 14	**18 (4)**	**15**	**2**
Pupil 15	**12 (4)**	**7**	**3**
Pupil 16	**48 (9)**	**35**	**7**

The results of Table 1 were given to the teacher in the hope that he might spot patterns thanks to his good knowledge of the pupils. After having expressed surprise about the variety of the combinations, the teacher drew his attention to high-achivers, like pupil 12. According to him, such profile might be prone to cover more websites and use more tags. This heavy use of tags would not necessarily reflect in higher number of components of their tags cloud, probably because they use common tags for several websites. The teacher also wonders whether high-achievers, like pupil 12, would not have a tendency to make an more intensive exploitation of their keywords in the final text. Pupil 16, also a high-achiever, is given in contrast. It seems that she created many tags during her study without using lots of them in the final text, like if some inner filtering had occurred while she was tagging and building her tag cloud.

3.4. Contextualization of the tagging activity

A section of the evaluation questionnaire aimed at identifying participant perceptions in engaging with a learning event like the PLEM-based lesson. The purpose was to investigate how they hypothetically posited the exploration of the topic done with the support of PLEM against other possible modes of engagement with the topic: regular chalk-and-talk teaching, collaborative learning, drill-and-practice exercises, etc. These possibilities replace the PLEM exercise into the general issue of the diversification of learning methods [26, 27]. The PLEM assignment appears as one learning event among others. The questions related to this issue requested an effort of imagination. Pupils were asked to give what would be the best location of the PLEM tagging exercise in a broader sequence on the topic that would comprise a lecture on the topic. Would the pupil put the tagging exercise before or after this lecture? Answers are given in Figure 8.

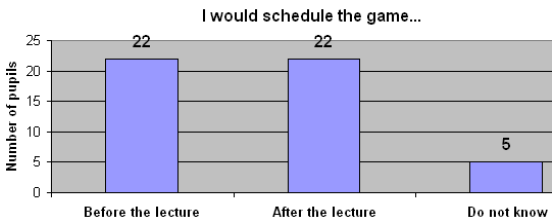

Figure 8. Ideal location of the PLEM exercise in a broader unit of learning.

Interestingly, relatively balanced percentages were also obtained in a research on the ELEKTRA serious game in physics [28], conducted on a sample of 49 pupils (see Figure 8). According to pupils' claim, instructional activities of a learning sequence could be given different arrangements. Exactly the same percentage of pupils was found that would prefer having the game before and after the regular lecture.

Figure 9. Ideal sequencing of activities using technological tools.

4. Discussion

The study draws 3 observations regarding the relevance and the approach of Web 2.0 tools in secondary school settings.

4.1. Formal learning requests specific approaches to Web 2.0

Does it make sense to make a limited use of so a complex Web 2.0 tool, as PLEM, in a traditional environment as a classroom? The use of Web 2.0 artifacts in formal instruction contexts has not retained much attention so far. Even widgets that claim to have a link with the realm of school are far less numerous than widgets conceived for other domains. A quick search, conducted on January 22, 2010, on Yahoo Widgets website with the keywords "school", "education" and "learning" returns respectively 19, 47 and 70 results while games, calendar, finance or news return 641, 105, 93 and 812 results. Neither in Google gadgets nor in Apple Dashboard widgets is education listed in the categories. In addition, a closer look shows that, from a qualitative viewpoint, many widgets retrieved for the three keywords (school, learning, education) are foreign to regular classroom or e-learning course, to say nothing of the sickening "Last day of school countdown" widget.

Up to now, the available scientific literature does not put a lot into this issue of infusing Web 2.0 technologies in formal education. Its efforts mainly bear on mash-up integration of existing widgets and third-party tools with institution-centric information, services, LMSs and VLEs [29, 30, 31]. Concerns about architecture, interoperability and reusability are dominant and these technical issues remain impenetrable, if not incomprehensible, for the educator who sticks to a basic concern: what it means to work with these new technological artifacts and how this affects the type of educational support offered to the students. Technological development takes for granted that existing tools and widgets can be loaded with enough instructional value to be used in relation with formal instruction processes or units of learning [32], which might turn not to be the case or only at certain conditions sometimes hard to achieve at school.

Current research also assumes that student's personal learning environments (PLEs) composed of widgets not offered by the institution should remain available as support for regular courses [33], which also might not be the case. For instance, Hardy et al. [34] show that even when undergraduates do have a good level of IT competence and confidence, they tend to be conservative in their approaches to university study, maintaining a clear separation between technologies for learning and for social networking. Based on a correlation between a high usage of social networking sites (like Facebook) while studying and lower grades, Kirschner and Karpinski [35] suggest that blurring this separation might be detrimental to learning. Margaryan and Littlejohn [36] lean on their findings on the low level of use of and familiarity with collaborative knowledge creation tools, virtual worlds, personal Web publishing, and other emergent social technologies, to cast doubts on the ability or the wish of students to use complex digital tools in their learning practice.

It is therefore important to keep technological development and real-world experimentation with teachers and students in parallel, otherwise there is a risk to solve highly technical challenges while basic instructional practice is neglected.

4.2. Scaffolds towards Web 2.0 tools are needed

In the area of personal learning environment research, Mödritscher et al. [37] have developed this daring pedagogical assumption: "we consider the learning environment an important part of the learning outcome as opposed to an instructional condition. Therefore, a learner designs her learning environment by establishing a network of people, artifacts, and tools (manually or with the support of personalization services) and interacting with that environment" (see also [38]). This stance, very interesting but demanding in regard to the development of meta-learning abilities, establishes a macro-competence ("I am capable of designing my learning environment") but does not provide any clue about the scaffolding needed to achieve it. Obviously, the pupils having participated to the

present study are far from the ambitious objective. Here, PLEM has been restricted to tagging functionalities. Despite this drastic amputation, the majority of pupils found that the task is at a right or at a high level of complexity (see Figure 9).

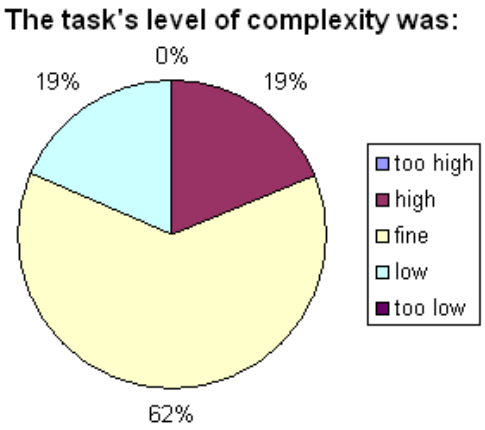

Figure 10. Even restricted and tutored use of PLEM represents a fine or high level of complexity for some pupils.

When asked to describe what PLEM is, only 2 pupil out of 16 managed to give an answer reflecting the specifics of the tool. How can a pupil be guided to the understanding and the optimal management of a personal learning environment? Maybe through very constrained tasks like the ones presented here, even though they look ridiculous to current users of PLEs. The problem is that these advanced users, and developers of PLEs are already deep into self-regulated learning and take Web2.0 functionalities for granted as well as the knowledge and the skills going along these practice. Such assumptions can induce a certain blindness to the conditions of acceptance and use in real-world instruction settings.

4.3. Account of the learning experience

One observation of this study goes beyond the use of PLEM. It touches upon the ability of pupils to describe their learning experience during a lesson. In all humanities courses, it is admitted that students must be able to provide clear, structured, detailed answers to questions about any covered topic. The topic "learning" – the basic activity of a student – might be an exception. The participants to this study have 9 to 10 years tuition behind them and they do not seem to be well trained to produce an integrated account of a lesson. Even though prominent authors (Schön, Bateson, Kolb) and researchers have been stressing for years the importance for learning of notions like meta-cognition, meta-learning, learning to learn, whose practice is supposed to gradually develop learners' awareness of what helps and hampers a consistent orchestration of the various dimensions of their learning processes, the procedural aspects (the "how I learnt") are blatantly missing in the description of the PLEM-based activity produced by the pupils. Without downplaying the value of the educational research mainstream which gives precedence to objective data, this study invites to dig into student's view on learning, to study the potential of narrative approaches to learning and to further elaborate the notion of "instructional meta-cognitive knowledge", coined by Elen and Lowyck [39] and rightly defined as knowledge about the learning potential of (elements of) instructional environments. The term highlights the object of that knowledge (instruction) and its self-reflexiveness (relationship to "my" learning). Instructional metacognitive knowledge may constitute an important mediating variable that accounts for the lack of direct effects of instructional media, methods or interventions on learning outcomes.

5. Conclusion

As rightly expressed by Merrill, Drake, Lacey, and Pratt [40], there is a major difference between formal and informal learning: "Students are persons who submit themselves to the acquisition of specific knowledge and skill from instruction, learners are persons who derive meaning and change their behavior based on their experiences. All of us are learners, but only those who submit themselves to deliberate instructional situations are students". This article reported an attempt to have a Web 2.0 tool, so far used for informal learning, used by pupils in a formal learning context.

A small-scale questionnaire survey allowed to explore secondary pupils' perspective on their first confrontation with such a tool called "Personal Learning Environment Manager". Satisfaction, feeling of learning, perceived effects of the tool on generic competence have been documented.

Results gave rise to observations related to the need for more investigation of real-world practice and of scaffolding techniques towards an autonomous usage of Web 2.0 artifacts.

The study lets also emerge educational challenges related to the development of instructional meta-cognitive knowledge.

6. Acknowledgement

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