Journal of Information Technology Education: Research

An Official Publication of the Informing Science Institute
InformingScience.org

JITEResearch.org

Volume 17, 2018

RESEARCH INTEGRATION IN INFORMATION SYSTEMS EDUCATION: STUDENTS' PERCEPTIONS ON LEARNING STRATEGIES, SKILL DEVELOPMENT, AND PERFORMANCE

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ABSTRACT

Aim/Purpose	This study aimed to explore whether students' self-reported use of various learning strategies affected their perceptions on different course activities as well as their perceived performance in terms of both cognitive learning outcomes and general skills.
Background	In a highly active learning environment that incorporates research into teaching, the effective use of various learning strategies is considered of high importance for the successful engagement of students. Yet, this line of research has mainly focused on individual learning. Shifting from individual to collaborative learning settings, the current study investigated whether students' use of self-regulated learning, peer learning, and help seeking strategies influenced their perceptions on both the group activities and the respective outcomes.
Methodology	At the beginning of the course, 81 first semester postgraduate students self-reported the level of use of self-regulated learning, peer learning, and help seeking strategies by filling in the respective subscales of the Motivated Strategies for Learning Questionnaire (MSLQ). Then, groups of 3 or 4 students were formed and instructed to create several learning artifacts of different types and conduct a peer-tutoring session, based on a topic assigned to them by the teacher. Additionally, the same groups conducted a research project of their own

Accepted by Editor Peter Blakey | Received: June 15, 2018 | Revised: August 17, August 30, September 11, 2018 | Accepted: September 13, 2018.

Cite as: Natsis, A., Papadopoulos, P. M., & Obwegeser, N. (2018). Research integration in information systems education: Students' perceptions on learning strategies, skill development, and performance. *Journal of Information Technology Education: Research, 17,* 345-363. https://doi.org/10.28945/4120

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	choice within course topics. Students' final grade served as an indicator of their academic performance. At the end of the semester, students filled in a questionnaire eliciting their perceptions on the process and the outputs of the course activities. Finally, through statistical analysis of students' responses to the questionnaires, the influence of learning strategies on students' perceptions and their academic performance was examined.
Contribution	Our findings contribute to the literature regarding the research-teaching nexus in higher education settings. More specifically, the study shows how students' self-reported use of learning strategies affects students' perceptions on the activities they were engaged in, their achievement of cognitive learning outcomes, and their skills development in a research-integrated course design.
Findings	Students perceived differently the value of producing and studying learning artifacts. Students who scored higher in the self-regulated learning and peer learning subscales of MSLQ perceived their role as more active in the preparation of the presentation for the peer-tutoring session, which was the artifact that required higher level of interaction among the group members. Students' final grades were influenced partially by their self-reported use of different learning strategies.
Recommendations for Practitioners	Integrating research into teaching through the assignment of research-related tasks to students can promote students' acquisition of domain knowledge and research skills. The merits of this approach can be further strengthened by having students working in groups and providing the outputs of their involvement in the research-related activities as learning material for their peers. Furthermore, students' individual characteristics (e.g., use of learning strategies and preferences should be taken into account when designing course activities).
Recommendations for Researchers	Researchers should continue to explore the way that various learning strategies influence different aspects of the learning process, especially in the achievement of cognitive learning outcomes and the development of general skills.
Impact on Society	Creating learning environments that foster students' active engagement with the course material and peer collaboration should be a vital goal of higher education institutes as it can improve students' performance and promote the necessary skills for self-directed and autonomous learning, a key competence in the modern workplace.
Future Research	In this study, both cognitive learning outcomes and general skills were assessed by students' final grade. In a future study, distinguishing these different types of learning outcomes would allow us to examine in more detail the impact of students' learning strategies and course activities on the accomplishment of cognitive learning outcomes and general skills.

Keywords research-teaching nexus, learning strategies, student perception, learning outcomes, academic performance

INTRODUCTION

Combining research and teaching is considered an essential goal to be achieved in higher education settings, often implemented by engaging active researchers as instructors or transforming students into active participants in research activities (Healey, 2005; Jenkins, Breen, Lindsay, & Brew, 2003; Obwegeser & Papadopoulos, 2017). Such settings have been shown to promote learning (Brew, 2003)

and help students to gain research competences, acquire domain knowledge, and accomplish cognitive, metacognitive, and affective learning outcomes (Aditomo, Goodyear, Bliuc, & Ellis, 2013; Spronken-Smith & Walker, 2010).

Furthermore, the benefits of integrating research and teaching could be enhanced when students are engaged in research-related activities in peer learning settings. The various forms of peer teaching and learning are considered as proper instructional methods to increase student engagement (Boud & Lee, 2005; Kearney, 2013; Topping, 2005), enhancing the development of the students' communication and collaborative learning skills (Justice, Rice, Warry, Inglis, Miller, & Sammon, 2007). There are various ways in which peer learning methods can be incorporated in a research-related pedagogy. Indicatively, students can act as tutors for their peers by presenting and discussing with them the findings of their research driven activities. Similarly, students can provide feedback or assess the outcomes of their peers' involvement with research-related activities. Moreover, students can collaborate in conducting their own research and reporting their findings. In that case, the interaction among peers and their joint actions will lead to the co-construction of new knowledge in the form of knowledge objects or artifacts which play both roles of a tool to mediate interaction and the outcome of the interaction (Damşa, 2014; Damşa & Ludvigsen, 2016).

In such group settings, the effective use of self-regulated learning (SRL) strategies is considered an important student characteristic that influences the success of collaborative learning (Panadero, Kirschner, Järvelä, Malmberg, & Järvenoja, 2015; Solimeno, Mebane, Tomai, & Francescato, 2008). Self-regulated learners are able to control their own learning by planning, monitoring, and regulating the learning process (Zimmerman & Moylan, 2009). Furthermore, peer learning (PL) and help seeking (HS) are resource management strategies (Pintrich, Smith, Garcia, & McKeachie, 1993) that can affect the process and outcomes of group learning. Students' effective interaction with their peers and teachers could maximize the learning benefits when they engage in collaborative activities. While these issues have been investigated in the fields of learning and pedagogy in general, the literature is scarce when these issues are examined in the context of Information Systems (IS) education and in the research-teaching nexus in particular.

For IS educators, the ongoing digitalization of our society and the increased pace of technological developments poses a severe challenge as it continuously pushes the boundaries of existing curricula (Harris & Rea, 2009). At the same time, the integration of both research and practical activities into the IS classroom is imperative in order to ensure a relevant and timely education that is well suited to prepare students for their future careers (Goldkuhl, Ågerfalk, & Sjöström, 2017). However, only few studies have yet investigated research-integration in the context of IS education and more research is necessary to inform future course designs (Obwegeser & Papadopoulos, 2017).

On these grounds, the scope of this study was to shed light to an overarching research question: how do students' learning strategies affect students' perceptions on performance and skill development in a research-integrated instructional design in the field of Information Systems?

BACKGROUND

RESEARCH – TEACHING NEXUS

Integrating research into teaching has a multidimensional impact on higher education and, particularly, on policy making, pedagogy, academic teaching, and research (Barnett, 2005; Brew, 2003; Levy & Petrulis, 2012; Spronken-Smith, Walker, Dickinson, Closs, Lord, & Harland, 2011). Literature suggests that students can gain learning benefits, when they are taught by active researchers and participate themselves in research-related activities (Healey, 2005; Jenkins et al., 2003). Healey (2005) proposed a model on embedding research activities in the teaching practice, according to which emphasis can be given either to the research content or to the research processes or problems, while students can act as audience or participants.

The successful integration of research into teaching is highly dependent on the scientific field, as both research and teaching can differentiate a lot across various domains (Brew, 2010; Durning & Jenkins, 2005; Griffiths, 2004). Nevertheless, students are expected to acquire domain-specific conceptual and procedural knowledge and at the same time, develop their research skills (Aditomo et al., 2013; Healey, Jordan, Pell, & Short, 2010). Furthermore, high-order thinking, problem solving and self-regulated learning skills can be fostered (Justice et al., 2007; Spronken-Smith & Walker, 2010), while through the selection of appropriate research-related activities, students' communication and collaboration skills can also be enhanced (Aditomo et al., 2013; Justice et al., 2007).

Learning Strategies

Researchers on learning strategies have used different perspectives to categorize and interpret student behavior and attitudes in a learning setting. For example, the Motivated Strategies for Learning Questionnaire (MSLQ) (Garcia & Pintrich, 1996; Pintrich et al., 1993) identifies 15 motivation and learning strategies, focused on the course level as the most appropriate level of analysis, while the Learning and Study Strategies Inventory (LASSI) (Weinstein, Schulte, & Palmer, 2002) includes 10 scales, analyzing strategies and attitudes at a general level (Duncan & McKeachie, 2005). In this study, we focused on metacognitive self-regulation, in connection to peer learning and help seeking, as these three strategies are the most relevant to students' experience in the research-integrated teaching approach in the collaborative setting that we examined.

Self-regulated learning (SRL) is differently defined by various authors (for a review, see Panadero, 2017), yet it is commonly agreed that it is cyclical and can be divided in different phases and subprocesses. According to the Zimmerman and Moylan (2009) model, SRL has three phases: (a) forethought, composed of task analysis, planning, and activation of self-motivation beliefs, (b) performance, identified as the actual execution of the task and the monitor and control of its progress, and (c) self-reflection, in which students evaluate their performance and make adaptations for future tasks.

In the context of individual learning, academic performance, learning motivation and the effective use of learning strategies are highly influenced by SRL (Dignath, Buettner, & Langfeldt, 2008). Moreover, carefully designed interventions can set the ground for the implementation of SRL in all educational levels, as shown in three meta-analyses of the field of SRL (Dignath & Büttner, 2008; Dignath et al., 2008; Sitzmann & Ely, 2011). In social learning environments, the promotion of SRL can be supported by having teachers or peers scaffold students in regulating their learning process (McLoughlin & Lee, 2010; Winters & Azevedo, 2005).

Additionally, peer learning strategies, such as the use of peer assistance and group awareness can improve SRL behavior and learning (Lin, Lai, Lai, & Chang, 2016), as peer assistance has the potential to motivate learners in persisting in training tasks and reflecting upon their learning status (Cheng, Liang, & Tsai, 2013). Students' individual self-regulatory processes can be also enhanced through help seeking strategies and assistance skills (Wang, 2011), as mutual help among peers positively affects learning motivation (Rozendaal, Minnaert, & Boekaerts, 2005). Furthermore, by using their peers or their teachers as a source of support, students may overcome obstacles in their learning process and achieve learning goals that could not be reached solely by themselves (Lu & Erkan, 2018).

Study Motivation and Research Questions

Several studies have discussed students opinions on the benefits of integrating research in teaching, (e.g., Buckley, 2011; Healey et al., 2010; Robertson & Blackler, 2006; Visser-Wijnveen, van Driel, van der Rijst, Visser, & Verloop, 2012). For example, Buckley (2011) reported that students' positive attitudes were reflected in their increased motivation and interest in the domain, while Robertson and Blackler (2006) argued that this was especially true when the students were engaged in research activities.

Additionally, students' perceptions on various aspects of the learning process have been associated with the use of various learning strategies (e.g., Riordan, Hine, & Smith, 2017; Thouin, Hefley, & Raghunathan, 2018). Results have shown the positive impact of students' perceptions on flipped learning (Sletten, 2017), feedback (Brown, Peterson, & Yao, 2016), assessment (Brown, 2011) and interactive learning environments (Liaw & Huang, 2013) in the effective use of several types of SRL strategies.

Extending these lines of research, the present study examines whether students' perceptions regarding both the research-related group activities and the outcomes of these activities are influenced by their self-reported use of different learning strategies. More specifically, the research questions the present study aims to address are:

- RQ1: How do students perceive the group activity of creating various types of learning artifacts in terms of communication, collaboration, participation, and helpfulness in achieving cognitive learning outcomes?
- RQ2: Are students' perceptions influenced by their, self-reported, use of learning strategies (i.e., SRL, PL, HS)?
- RQ3: How are students' perceptions on the development of general skills influenced by students' engagement in the overall course activities and their self-reported use of learning strategies?
- RQ4. Is students' academic performance influenced by their perceptions on the course activities and their self-reported use of learning strategies?

METHOD

DOMAIN

The course "Information System Development and Implementation in a Business Context – ISDI" is a compulsory, 11-week, 10-ECTS course offered during the first semester of a research-based master program. In the course, students are expected to gain knowledge on developing and/or implementing IS in companies and organizations and to identify the respective challenges, risks, and complexities. Finally, through their engagement in the course activities, students should acquire research competencies, write and communicate clearly the output of their research, work effectively with others, and assess peer work. To pass the course, students are assessed on the basis of their group report in combination with an individual, oral exam that covers all aspects of the course curriculum.

PARTICIPANTS

In total, 81 students formed freely 22 groups. Seven of those groups consisted of three students and 15 groups consisted of four students. Students participated in the study activities as part of the ISDI course.

COURSE STRUCTURE

Table 1 presents the activities that the students were engaged in the ISDI course and whether these activities were implemented in group settings.

Lectures were held once per week and lasted for 3 hours. Starting from the second week, the lectures were organized in two parts. In the first part, the teacher presented topics and concepts of the field of IS by employing direct instruction as the main teaching mode. In the second part, two groups of students assumed the roles of peer tutors, presenting their work on the topic to the class audience.

Table 1. Course activities in the ISDI course

Course activities	Relation to research	Group settings
Attending lectures	The teacher, being active researcher himself, presents his own research activities with additional presentation of anecdotal evidence and rich personal experience.	no
Students' creation of learning material	Students work in groups. They are given a publication on a specific topic and are asked to prepare different artifacts that could serve as course learning material.	yes
Peer-tutoring sessions	Based on the artifacts they prepared and the academic processing of other relevant publications, students in groups prepare a peer-tutoring session where they present the article and discuss it with their peers. Lastly, student audience and the teacher assess the group presentations.	yes
Attending workshops	Students reflect upon and discuss the research design and methods of critical IS papers with the assistance of more qualified peers (i.e., Teaching Assistants - TAs) in workshops. Moreover, they discuss their ideas for the research of their own choice they have to conduct.	yes
Conducting a research project	Students in groups setup and conduct a research project on a topic selected by themselves and report on their research methodology and findings	yes
Students' defense of their research (Final exam)	Individual oral examination in a form similar to a thesis defense.	no

In order to foster students' active engagement with the course material, students in groups were asked to process a scientific paper and create five artifacts that could serve as learning material for their peers:

- An annotated version of the paper, with comments and emphasized parts;
- A list of five highlights, providing a concise view of the paper;
- A list of five questions, along with their answers, that would cover the major issues discussed on the paper;
- A short summary of 200-300 words;
- A comprehensive presentation of the topic for the peer tutoring session that could include slides or any other material. The total duration of the presentation did not exceed 40 minutes, including a discussion session with the class audience and the teacher.

The selection of the artifacts was based on the fact that annotating, paraphrasing, asking questions, and summarizing are considered effective reading strategies, leading to text comprehension (McNamara, Ozuru, Best, & O'Reilly, 2007). Furthermore, according to the Interactive, Constructive, Active, Passive (ICAP) Framework (Chi & Wylie, 2014), as students become more engaged with the

learning materials – from passive to active, to constructive, to interactive – their learning increases. In the examined course activity, students started by passively engaging with the paper, by reading it. Then, students engaged with the paper in a more active way, by annotating and adding comments to it. Writing the highlights, formulating the questions and answers concerning their topic, as well as summarizing the paper in their own words required students' constructive engagement with the paper. Finally, their engagement with the paper was completed with their interactive involvement in the preparation of the peer-tutoring session when the students presented and discussed their article with their peers.

Adding the collaborative dimension allowed students to interact with their peers and to give or receive peer support on their tasks. Moreover, their joint work included the production of knowledge artifacts with different levels of complexity, such as annotating a paper or writing a group report about a research project of their choice. The artifacts were expected to mediate the communication among the group members and to provide useful insights regarding the productive interactions among group members by studying their evolution (Damşa, 2014; Stahl, Ludvigsen, Law, & Cress, 2014). Furthermore, students were involved in peer assessment activities, as they assessed the material created by their peers in terms of helpfulness for the exams.

The three workshops that were organized by TAs during the semester allowed students to apply the knowledge gained from the lectures and their participation in the material creation activities as they worked on solving problems of IS in organizations. Additionally, in these workshops the groups of students could discuss their ideas regarding their research project. Students had the opportunity to present their research aims and methods and get feedback and assistance from their peers.

Finally, the group report describing the student research served as the basis for their final grade. Students handed in the report one month before their exams, which were conducted orally in a form similar to a thesis defense and was individual for each student.

In the aforementioned learning design, the teacher's main role was to facilitate student engagement in the learning process. The students received detailed instructions and ready-made examples regarding the format of the artifacts. Moreover, they gained access to a separate Google Drive folder to each group, in which students could find all the necessary assignment material as well as empty templates for the five deliverables. Students were encouraged to use Google Docs in the course activities, thus providing us with the opportunity to examine the evolution of the artifacts. Yet, they could opt for working offline and upload their deliverables at the end of the process.

Measures

Two research instruments were employed for this study: the Motivated Strategies for Learning Questionnaire (MSLQ) (Garcia & Pintrich, 1996; Pintrich et al., 1993) and a study questionnaire developed by the authors to specifically capture students' perceptions of the course activities.

MSLQ is a valid and reliable scale for assessing students' use of various learning strategies. This scale includes 81 questions grouped in 15 scales. For this study, three relevant scales were selected, namely self-regulated learning (SRL), peer learning (PL), and help seeking (HS). This version of the MSLQ included 19 closed-type questions (SRL: 12; PL: 3; HS: 4), each one using a 7-point Likert scale ranging from "1: Not true at all" to "7: Very true".

The study questionnaire employed a 5-step Likert scale and included three dimensions regarding the students' perceptions about (a) the volume and format of communication during the group activities, (b) the level of collaboration and participation during the creation of the various artifacts, and (c) the helpfulness of the course activities in order to achieve cognitive learning outcomes and general skills.

A set of three closed-type questions, each one using a custom 5-point Likert scale, assessed both the volume and format of communication. A scale ranging from "One of us was responsible for producing the final version" to "We worked together on the same parts producing together the final ver-

sion" was used to assess the way groups collaborated for the creation of each of the learning artifacts. Moreover, a 5-point scale ranging from "Discussant" to "Leader" demonstrated the students' perceived level of participation to the creation of each artifact.

The indicators for the perceived cognitive learning outcomes were students' responses concerning the impact of course activities on understanding the paper and preparing for the exams. The general skills referred to reading and analyzing original scientific papers, writing and communicating clearly, and working effectively with others.

Students' academic performance was measured at the end of the semester. An assessment committee comprising of the teacher of the course and two external members graded the students based on the report they had handed in and their individual oral defense. Their final grade was based on a 7-point grading scale (7 being the highest grade). Finally, the teacher also assessed the tutoring sessions and all the artifacts created by the students.

PROCEDURE

In the beginning of the course, students were asked to fill in the adjusted MSLQ instrument in order to self-report the levels of use of self-regulated learning, peer learning, and help seeking strategies.

Groups of three to four members were then formed and each was assigned a course topic and a scientific paper by the teacher. Each group had two weeks to prepare the knowledge artifacts and its peer-tutoring session in the class. Finally, at the end of the exams, students filled in the study questionnaire regarding the activities they were engaged in during the course.

DATA ANALYSIS

For all statistical analyses, a level of significance at .05 was chosen. Due to violation of the assumption of normal distribution for some of the variables, non-parametric statistical techniques were employed.

RESULTS

STUDENTS' PERCEPTIONS ON ARTIFACTS

Table 2 presents students' responses regarding the volume and format of communication during the creation of the different learning artifacts.

Table 2. Students' responses regarding group communication

Question (scale: 1-5)	M	*SD*
How much communication happened in your group?	4.50	*0.80*
How much of your communication was online?	2.88	*0.90*
How much of your communication was face-to-face?	4.29	*0.80*

There was a high volume of communication in the groups, and students clearly preferred face-to-face communication.

Table 3 presents students' perceptions on how the different artifacts affected issues such as the volume of collaboration that occurred in the group (Collaboration), the level of responsibility they assumed (Participation), the level of paper understanding they achieved (Understanding), and the helpfulness of student-produced artifacts (of others) towards preparing for exams (Preparation).

Students said that they collaborated in their groups the most during the production of their presentation, while they worked mostly individually in producing the annotated version of the paper. Friedman test results showed a statistically significant difference in the collaboration scores of the five artifacts ($\chi^2(4, 81) = 35.40$, $p < 0.01$). Post-hoc analysis with Wilcoxon Signed Rank tests (with Bonferroni correction) revealed that collaboration during the production of the presentation was significantly higher than in any other artifact ($p < 0.05$). Similarly, Friedman test results confirmed that there was a significant difference in the way students perceived their level of participation in producing the different artifacts ($\chi^2(4, 81) = 22.56$, $p < 0.01$), with post-hoc analysis showing, once again, that students felt that they had a significantly more active role while working on the presentation, than on any other artifact ($p < 0.05$).

Table 3. Students' perceptions on learning artifacts

	Working on artifacts						**Studying others' artifacts**	
	Collaboration		**Participation**		**Understanding**		**Preparation**	
Artifact (scale: 1-5)	M	*SD*	M	*SD*	M	*SD*	M	*SD*
Annotated version of the paper	2.99	*1.46*	2.74	*1.33*	2.77	*1.22*	2.46	*1.21*
Highlights	3.45	*1.56*	3.03	*1.31*	3.60	*1.07*	3.37	*1.19*
Q&A	3.75	*1.46*	3.13	*1.22*	3.35	*1.31*	3.00	*1.36*
Short summary	3.46	*1.41*	3.03	*1.26*	4.02	*1.00*	3.92	*1.10*
Presentation	4.22	*0.86*	3.72	*1.08*	3.21	*1.29*	2.63	*1.19*

Students' responses on how much their engagement in the different artifacts allowed them to better understand the assigned paper showed that producing the short summary was the most helpful task, while annotating the paper was the least helpful task. Friedman test revealed, once again, that students developed a significantly different opinion on the five artifacts ($\chi^2(4, 81) = 41.45$, $p < 0.01$), while post-hoc analysis confirmed that the task of summarizing the paper received a significantly more positive evaluation than the other tasks, while annotating the paper was perceived as the significantly less useful task ($p < 0.05$).

Shifting from the role of the author to the one of the reader, students said that reading the summaries of other groups was very helpful in preparing for the course examination, while paper highlights also received positive evaluation. On the contrary, attending peer presentations and reading annotated versions of papers received negative reviews. Friedman test confirmed that students' opinions towards the five artifacts were, indeed, significantly different ($\chi^2(4, 81) = 51.24$, $p < 0.01$), with post-hoc analysis attesting that the summary of a paper was considered significantly more useful in preparing for exams than any other student-produced artifact ($p < 0.05$). Table 4 presents the teacher's assessment of the quality of the five artifacts.

It can be seen that the teacher generally evaluated the student-generated material as of high quality. The presentation was the artifact that appears to be less successful, whereas the annotated version of the paper and the summary were the artifacts that seem to have met the teacher's expectations the most.

Table 4. Teacher assessment of the quality of the student-produced artifacts

Artifact (scale: 1-5)	M	*SD*
Annotated version of the paper	4.50	*1.19*
Highlights	4.14	*0.94*
Q&A	3.68	*1.29*
Short summary	4.41	*0.67*
Presentation	3.48	*0.95*

STUDENTS' SELF-REPORTED USE OF LEARNING STRATEGIES

Table 5 presents the descriptive statistics for students' self-reported levels of self-regulating learning, peer learning, and help seeking strategies. The Cronbach's alpha coefficient for the self-regulated learning, peer learning, and help seeking subscales of MSLQ were 0.84, 0.75, and 0.73, respectively, indicating satisfactory reliability.

Table 5. Descriptive statistics for students' use of different learning strategies

Learning Strategies (scale: 1-5)	M	*SD*
Self-Regulated Learning (SRL)	4.40	*0.88*
Peer Learning (PL)	3.99	*1.27*
Help Seeking (HS)	4.26	*1.16*

To investigate the relationship between the helpfulness scores and the use of different learning strategies, Spearman's rho coefficient was calculated. No correlation was found between students' opinions regarding the helpfulness of the artifacts produced by their peers (Preparation, Table 3) and the peer learning and help seeking strategies. A positive correlation was found between the use of self-regulated learning strategy and students' perceptions regarding the helpfulness of engaging in the creation of the different artifacts on paper understanding ($r = 0.29$, $n = 81$, $p = 0.04$) (Understanding, Table 3). Higher scores on self-regulated learning strategy were associated with more a positive assessment of the activity.

Finally, Spearman's rho coefficient revealed that there was a positive correlation between help seeking scores and the perceived level of communication, $r = 0.38$, $n = 83$, $p = 0.01$. Students with high values in the HS subscale experiences higher levels of communication during the production of the artifacts. SRL and PL strategies did not correlate significantly with the perceived level of communication.

STUDENTS' PERCEPTIONS ON DEVELOPING GENERAL SKILLS

Table 6 presents student responses on the perceived helpfulness of the overall course activities in the development of general skills.

Table 6. Students' responses regarding the helpfulness of working on course activities in order to develop general skills

	Helpfulness	
Skill (scale 1-5)	M	*SD*
Read and analyze original research papers	3.56	*0.92*
Writing scientific reports clearly and organized	3.38	*0.93*
Communicating clearly and organized	3.46	*0.87*
Working effectively with others	3.62	*1.09*
Total	3.50	*0.67*

In general, students evaluated positively their involvement in the overall course activities, regarding the acquisition of skills on processing academic articles, writing scientific reports, and communicating their findings as well as collaborating with their peers.

Spearman's rho coefficient revealed a positive correlation between reading and analyzing original research papers and the use of help seeking strategy ($r = 0.35$, $n = 81$, $p= 0.02$), suggesting that students with higher levels of HS strategies are more appreciative of course activities related to reading and analyzing research literature. Furthermore, the use of self-regulated learning strategy correlated significantly and positively with the total score (mean of the four skills in Table 6) of the different general skills ($r = 0.30$, $n = 81$, $p= 0.03$). Higher use of the SRL strategy is associated with higher students' scores regarding the helpfulness of the course activities in order to achieve general research skills.

Students' Academic Performance

The analysis of students' grades revealed that the average grade of the whole class was high ($M = 5.34$, $SD = 1.37$), while no student failed the exams. The Spearman's rho coefficient was calculated to investigate the relationship between students' perceptions of communication, participation, and collaboration during the group work and their academic performance. A positive correlation between the communication among the group members and the academic performance was found ($r = 0.28$, $n = 81$, $p = 0.03$), with higher scores in the perceived communication associated with higher final grades. No correlation was found between perceived collaboration and participation scores and students' final grades.

Regarding the use of different learning strategies, Spearman's rho coefficient revealed a positive correlation between the help seeking strategy and the final grades ($r = 0.23$, $n = 81$, $p = 0.04$). No correlation was found between the use of self-regulated learning and peer learning strategies and the students' academic performance.

Discussion

RQ1: Perceptions on Learning Artifacts

Result analysis revealed students' successful engagement with a course design that incorporated the research-teaching nexus and peer learning approaches. Students collaborated effectively in processing a scientific article and creating educational material for their peers. They communicated effectively in order to develop knowledge artifacts of different complexity, while the task was assessed positively by the students in terms of paper understanding and helpfulness for the exams. In line with available literature, assigning the role of producers of learning material to students has shown to promote

deeper engagement with the course and provide valuable cognitive learning gains (Bovill, Cook-Sather, Felten, Millard, & Moore-Cherry, 2016).

Nevertheless, students perceived the helpfulness of the various artifacts differently. They considered their engagement in the creation of the short summary as the most beneficial for them in order to understand the paper assigned to them, while the annotated version of the paper was the artifact perceived the least helpful. Furthermore, the creation of the annotated version of the paper was the artifact in which students collaborated the least, by assigning the leader role to one of the students of the group. These findings are in line with the ICAP Framework (Chi & Wylie, 2014), suggesting that students increase their learning when they engage themselves with the learning material constructively and interactively.

Students positively evaluated their peers' artifacts as learning material that could help them prepare for the exams. In particular, they assessed the helpfulness of the short summary and the list of highlights as high. This finding suggests that the output of students' interactive engagement with instructional material can also be useful for their peers. Similarly to Leopold, Sumfleth, and Leutner (2013), providing students with short summaries of the instructional material can lead to learning gains for students. The list of questions along with their answers came third in students' ranking of the different artifacts. As mentioned before in Bates, Galloway, Riise, and Homer (2014) and Yang, Guo, and Yu (2016), the creation of meaningful questions may not be a straightforward process for students. Finally, the annotated version of the paper was the artifact that was considered the least useful for exam preparation.

On the contrary, the teacher assessed the annotated paper as the artifact that best met his expectations in terms of quality, followed by the short summary and the list of highlights. It seems that students perceived as more useful the activities that required their active engagement with the learning material, even though their engagement resulted in output that did not thoroughly met teacher expectations. The preparation for the presentation was the activity that students were most actively engaged in and collaborated to the greatest extent. Yet, the preparation for the presentation was perceived as less helpful in understanding the paper assigned to them. Moreover, their peers' presentations did not assist them sufficiently in order to prepare for the exams. As such, it is assumed that creating presentations might be useful for the creators, but not for the audience.

RQ2: Learning Strategies

According to students' responses in the MSLQ instrument that was administered at the beginning of the course, it was apparent that their ability to apply self-regulated learning, peer learning, and help seeking strategies in order to successfully tackle learning tasks was highly developed. This could be the reason for the slight differences that were found among the students regarding their perceptions on co-creating learning material for their peers.

Students who considered themselves as self-regulated learners appreciated more their involvement in the creation of the learning artifacts in order to understand the paper they had to process. Furthermore, they perceived their role as more active in the preparation of the presentation for the peer-tutoring session. Students that were able to regulate cognitive, metacognitive, behavioral, and affective aspects of their own learning were keener to take the lead in accomplishing tasks that required active engagement with the learning material.

When students were engaged with such tasks in group settings, the effective utilization of peers was important for the successful accomplishment of those tasks. Similarly to the self-regulated learners, students who scored highly in the peer learning subscale of the MSLQ perceived their level of participation as higher in the creation of the presentation, which is the artifact that required higher levels of interaction among the group members. Students who self-reported high levels of the help seeking strategy appreciated the communication with their peers during the artifact creation activity. This finding could be attributed to the fact that students had not been given explicit guidelines regarding

their collaboration, but they were able to select their preferred way of work. This may have led them to create a flexible and adaptive activity space that allowed even students with extremely low scores on the peer learning scale to participate in a self-satisfying manner. This finding is in line with the Script Theory of Guidance (Fischer, Kollar, Stegmann, & Wecker, 2013) which states that students' prior knowledge and skills influence the optimal level of guidance in collaborative learning.

RQ3: General Skills Development

Apart from producing the artifacts, students were also engaged in peer-tutoring, peer assessment, setting up and conducting their own research, and reporting their findings. The analysis of students' responses revealed that they positively perceived their involvement in the aforementioned activities in terms of developing general skills, i.e., reading and analyzing academic literature, writing scientific papers, collaborating with others, and communicating effectively their work. These general skills are considered important, among others, in the acquisition of research competences (Böttcher & Thiel, 2018), which is a basic aim of a master degree program.

Self-regulated learners stated that the overall course activities assisted them in obtaining general skills. In the research-integrated course design employed in the present study, the role of students was transformed from merely passive listeners to active contributors in the learning process. Students engaged in co-constructing learning material, assessing their peers, conducting a research, and reporting their findings, while the teacher's role was to scaffold and facilitate students' involvement. Self-regulated students valued more positively than their peers did their engagement, probably because the activities fostered their autonomy and had a positive impact on the cognitive, metacognitive, and behavioral aspects of their learning (Nilson, 2013).

Students who scored higher in the help seeking strategy positively assessed the helpfulness of course activities in reading and analyzing scientific papers. In the proposed course design, students had to work in groups in order to process academic literature and produce knowledge artifacts as an outcome. This indicates that collaboration can help students in processing academic texts, as was also reported by van der Pol, Admiraal, and Simons (2006), and that the effective use of appropriate learning strategies can further assist students in dealing effectively with research-related activities.

RQ4: Academic Performance

Students who perceived their communication with their peers during the group work as high performed better in the final exams at the end of the semester. Possibly, when students engage in productive interactions while collaboratively creating learning material for their peers, they benefit highly in the learning process, as reflected in their final grades.

Students with higher scores in the help seeking strategy performed better in the final exams. This finding implies that the effective interaction with peers and teachers, as indicated by the help seeking strategy, could maximize the learning benefits of students in an active learning environment. On the contrary, students' self-reported use of self-regulated learning and peer learning strategies did not have an impact on students' final grades. Even students who scored low in the self-regulating learning and peer learning scales of MSLQ achieved high grades in the final exam. It is likely that when peer learning methods are employed, the social regulation of the learning process may play a more critical role in academic achievement. The high final grades of students imply that regulating the learning of the peers (co-regulation) and regulating the learning of the group (socially shared regulation) (Hadwin, Järvelä, & Miller, 2011) may be more important than self-regulation of learning in collaborative settings (Panadero et al., 2015).

Limitations and Future Studies

Being the first time that the specific learning design was employed, the aim of this study was to explore its influence on students' opinions and academic performance, in general. A certain limitation

of this approach is that students' final grades were used as the measure of their accomplishment of both cognitive learning outcomes and general skills. In a future study, it could be more useful to distinguish these different types of learning outcomes and assess them in different ways, in order to examine more accurately the impact of the various activities on their successful achievement.

Regarding students' creation of learning material for their peers and the writing of the final research report, students preferred face-to-face sessions and did not exploit the use of digital media. This prohibited us from exploring the evolution of the different artifacts and analyzing students' interactions towards the creation of these artifacts. In a future study, this limitation could be tackled by asking students to submit the intermediate versions of the artifacts and reflect on the process of their creation. Their peers could assess these intermediate products and provide feedback that could be incorporated in the following editions, enhancing thus the proposed learning design.

CONCLUSIONS

This study contributes to the ongoing debate on research-teaching integration in higher education and provides empirical evidence on the effectiveness of incorporating research-related and peer learning approaches in a postgraduate course in the field of Information Systems. During the semester, student groups were engaged in various research-related tasks, i.e., processing of academic texts, co-creating learning material for their peers, assessing their peer work, and, finally, setting up, conducting, and reporting the findings of a research of their own topic. Students perceived positively the various activities in which they were engaged and valued high their involvement in order to achieve cognitive learning outcomes and develop general skills. Their perceptions were influenced partially by their self-reported use of self-regulated, peer learning, and help seeking strategies. Self-regulated learners appreciated more their involvement in the creation of learning material for their peers and perceived their role as more active in the group work. Yet, all students, regardless their perceptions on the activities or their self-reported use of learning strategies, succeeded in the final exams. Their grades were not influenced by their perceptions on the course activities nor the learning strategies use, implying that the course design was effective for students with different characteristics.

The implication for learning designers and teachers is that assigning research-related activities to students could be an effective approach in higher education settings. By providing students with an active role in the learning process, the course activities offered opportunities to all students to apply and develop their skills in processing, presenting, and discussing academic work and fostered their engagement in the course, despite the different learning strategies the students may have employed. Furthermore, this approach can be enhanced by having students work in group settings and create knowledge artifacts that can be used as educational material by their peers. Artifacts that require higher degrees of active engagement with the learning material are more likely to be positively evaluated by the students regarding various aspects of the learning process (e.g., collaboration, participation, understanding, etc.) leading at the same time in higher cognitive gains and enhanced research skills acquisition.

ACKNOWLEDGEMENTS

This work has been partially funded by a Starting Grant from AUFF (Aarhus Universitets Forskningsfond), titled "Innovative and Emerging Technologies in Education".

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