Understanding the Challenges of Introducing Self-driven Blended Learning in a Restrictive Ecosystem

Step 1 for Change Management: Understanding Student Motivation

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Abstract: This paper describes the implementation of a prototype for blended learning in a Software Engineering course at the Cooperative State University Baden-Württemberg in Karlsruhe. The University has certain particularities that distinguish it from other Universities because students alternate quarters between study and work. Thus, students receive a salary during their three years towards earning a Bachelor Degree and attendance is mandatory. In cohorts, around 30 students spend an average day with at least 5 hours of frontal lecture in the same classroom. Software Engineering takes up about 5 hours a week of in-class time in their second year of study and is the first course students have seen with a self-driven, blended learning format. The paper describes the set-up of the learning environment based on known research results of motivational factors. Based on an exploratory survey of 59 students, these motivation factors are compared to students' motivations and their realizations in traditional and self-driven lecture format. Answers revealed that change presents a major challenge for most students and identifies the need for explicit habit building, change management and improved serving of students' basic needs in a grade-based ecosystem.

1 INTRODUCTION

In this paper, an approach to self-driven blended learning is adopted with a group of 90 students in their second year (out of three) during their Bachelor program at the Cooperative State University Baden-Württemberg in Karlsruhe, Germany. In this setting, the academic year is based on a Quarter system. Students spend alternating quarters studying or working, earning a salary throughout the year. Their attendance at University is mandatory and they study in cohorts of around thirty students. As students are required to remain within their cohort in order to graduate, failing a course results in the failure of the entire Bachelor degree. As a result of this set-up, students spend more than 5 hours a day and sometimes up to 25 hours per week in frontal lectures in a single classroom. 15 minute breaks mornings and afternoons and a lunch break in the middle of the day round up the program. Evenings and weekends are spent with learning the material. Some full-time lecturers can teach over 20 hours a week, including courses outside of their immediate expertise. Other lecturers teach on the side while working in industry. Both students and lecturers work under intense time and performance pressures.

Students have never before been responsible for their own learning beyond what is needed to perform well on an exam in a traditional setting. Neither in school nor at the University has self-regulated learning been explored. However, there are necessary reasons for changing the learning environment away from the frontal lecture from employers', students' and University points of view.

From the employer point of view, it is important to move students from a check-box based approach to obtaining good grades to a mastery based approach, which is more aligned with workplace demands. Whereas in school, handing in something to be graded on a certain date may count as a completed task, industry work environment expects several passes through a piece of work until perfected. While one might think that behaviour can be adapted based on environment, employers report that key reasons for not hiring students include their lack of transfer skills, lack of critical reflection on

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own performance and lack of soft-skills (Heidenreich, 2011).

From the student point of view, reasons for changing the format of coursework are threefold: First, the number of hours spent listening to lectures can be decreased by letting students work independently towards pre-defined goals, thereby becoming more actively involved in the learning process. Then, with up to 25 weekly hours of frontal lecture, this format may be perceived as a nice change of pace. Finally, due to the noticeable difference in know-how between students and even between lecturer and student in the case of current industry standards, there is an advantage to leaving space to learn from other students in the small-class setting.

The University's reasons include knowledge of research results about positive learning outcomes when creating a more active and problem based learning environment (Garrison and Kanuka 2004; Goel and Sharda, 2004) despite the fear of change (Hall et al., 2002). Key reasons for change include the overwhelming variety of high-quality information sources that are available on the web. With the most current appearance of MOOCs (Massively Open Online Courses) from some of the top Universities in the US, standards for frontal lectures are set, including written transcripts of what was said, the ability to rewind and re-listen to any lecture any time and communicating with an active global community. Increasingly, excellent information is available via Youtube and Internet outside of any systematic courses as students are relying less and less on books to acquire knowledge in the field of Information Technology.

The goal of this exploratory study and corresponding survey is to understand student motivation in the example of a restrictive environment, where grades and efficiency are central to survival. A gap in research on this topic has been noted the literature (Shea Bidjerano, 2010). Software Engineering was chosen as the first class to move towards self-driven learning for three reasons: 1. many hours are available for a reasonable amount of material so there is room for slow buy-in, 2. high-quality information is available online for this topic, 3. large differences in student know-how, ranging from expert to novice based on their work experience, 4. the subject is very applied and matches closely with most students' reality at work. Students experienced the new set up and were asked to respond to an initial exploratory survey that revealed a surprising and much deeper complexity of the issues involved in this change.

Section 2 will summarize the theoretical foundations of the didactic set-up for this approach. Section 3 will describe the experience from the teacher point of view. Section 4 and 5 will evaluate qualitative and quantitative results from an exploratory survey taken at the end of the second month out of the 11-week long course in order to understand how student motivation corresponds with inbuilt motivators for the new format. Section 6 will conclude by discussing mismatches in motivation and proposing concrete steps to manage change and build habits.

2 THEORETICAL FOUNDATION

The software engineering course was redesigned around motivators with content and platforms aligned as shown to be important (Derntl and Motschnig-Pitrik, 2005). This section discusses the theoretical foundation behind the motivators, the content design and platform requirements.

2.1 Motivators

Despite some controversy as to the exact definition of extrinsic and intrinsic motivators (Rheinberg, 2006), we will distinguish internal drivers such as autonomy, purpose, and mastery from external drivers, a number of chosen mechanics from gamification that have been shown as effective in real world systems with academic research still forthcoming in this emerging field.

2.1.1 Intrinsic Motivation

According to positive psychology's theories about motivation (Pink, 2010; Deci, 2012; Scott Rigby et al., 1992; Seligman and Csikszentmihalzi, 2000; Kearsley, 2000; Gagné and Deci, 2005), humans are motivated to work on cognitively difficult tasks when they are granted autonomy, purpose and mastery. Accordingly, the course was designed to grant students *autonomy* by allowing choice of speed and order for studying six out of nine topics of their choice (see 2.3) with enough time to obtain *mastery*. The *purpose* was given because the acquired knowledge would make students more powerful partners in project work for the coming quarter and because the material is immediately useful at their workplace as software engineers in training.

2.1.2 Extrinsic Motivation

Gamification is a controversial topic that has become ubiquitous in the business world since 2010 when the term was coined by the gamification community (Zicherman and Linder, 2010; McGonigal, 2012). Part of the idea behind gamification is to understand which mechanics keep gamers motivated to come back to play and apply those constructs to non-game environments with the goal of encouraging similar engagement. Since these have been shown to work (Lepper et al., 1999; Charles et al., 2011; Rebitzer and Taylor, 2011), some typical game mechanics were incorporated into the classroom as listed in Table 1.

Table 1: Theoretical Motivators / Classroom Realization.

	Mechanics	Realization
External Motivators Platform	Aesthetics	Gamification platform
	Progress Bar	Poster on wall
	Overview	Gamification platform
	Feedback	Moodle online quiz
	Leaderboards	Email (anonymous)
	Points, Levels Heroes	Gamification platform
Internal Motivators Classroom	Autonomy	Lecture on demand Various paths though content Personal timeline Personal learning materials and interaction
	Mastery	Quiz until mastery Bloom's Taxonomy
	Purpose	2 Semesters Project based
	Basic Needs	Teaching to the test

2.2 Content

Content is structured to support intrinsic motivation of autonomy as defined above for the purpose of this work. A choice of independent pathways organized into levels through the material is provided. Each of three paths consists of three topics of mastery divided into Bloom's cognitive levels as described below (see also Table 1).

2.2.1 Topic Organization into Levels

Topics covered in this Software Engineering course is structured into three pillars of three topics each: Software writing (Design Patterns, Metrics, Testing), Communication (Documentation, Estimation, Reverse Engineering) and Project Management (Processes, Configuration Management, Lifecycle Management) and culminates in project based experience. The current version of the topic separates the theoretical parts into the first Quarter and the project part into the second Quarter, with students spending the intermittent Quarter in their respective work places. This separation is designed to give students enough time to learn all aspects of Software Engineering before applying the collective know-how in a project. Additionally, tuned into the subtopics, they are able to inspect how these topics are treated in their workplace during their practical phase, thereby integrating industry know-how into the classroom.

2.2.2 Towards High-level Thinking with Bloom's Taxonomy

Bloom's taxonomy classifies educational goals into a hierarchical system in the cognitive domain and builds towards higher level thinking skills and has been used effectively in Computer Science in the past (Krathwohl, 2002; Thompson et al., 2008). An example is depicted in Figure 1 for the topic of Software Testing. At the knowledge level, students receive a theoretical lecture on demand. Here, terminology, facts, principles and theories are presented. For the example of testing the lecture explains what the different types of software tests are, when they are performed and what they cover.

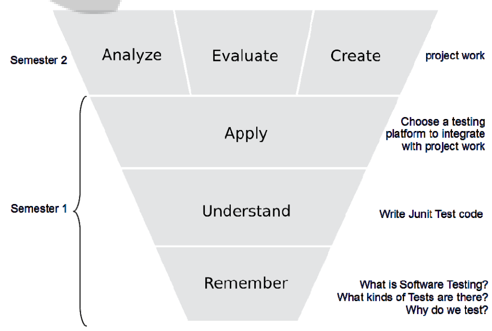

Figure 1: Bloom's Taxonomy (Bloom '56) as applied to one of the learning areas in Software Engineering.

Understanding the facts is encouraged by asking students to then implement several unit tests for a given suggested code or a code of their own choice. They are then asked to choose a testing framework for later use in their projects to prepare for the next semester. For example, how can tests be automated and tied in with the lifecycle management. Analysis, Evaluation and Creation of further tests is then left to the actual project based experience in the next Quarter/Semester in a larger scale testing environment.

2.3 Blended Learning

Learning platform(s) are integrated into the classroom in order to create a blended learning environment to match motivators (Bekele, 2010; Graham, 2006; Mohammad and Job, 2012) with the known shortcoming of not living up to professional graphic interfaces that people are used to these days (Schober and Keller, 2012). Table 1 lists the connections that were implemented in this case to align motivators with elements of blended learning environment.

2.3.1 E-Platforms

Lecture slides and learning objectives for each of the nine topics to be studied where provided on Moodle and supplemented with links to external information and tools. Online quizzes provided a 24x7 platform for submitting work to be checked manually by the lecturer to provide more or less immediate and personal feedback. In addition, a separate gamification platform apart from Moodle supplied explicit task lists, levels, points, a progress bar and an overview over class progress that was also available in paper form on the wall.

2.3.2 Human Interaction

With 5 hours of in-class time per week and mandatory attendance, this time is used for teamwork among students and choosing frontal lectures on any of the nine topics on demand as the student progresses through the topics (levels). Theoretically, the student has the opportunity to pick up to 9 lectures in any order over the course of 11 weeks duration of the quarter and work through related problem sets and quizzes with feedback from instructor with no restriction on collaboration. Only six topics were required for the final exam that covers only the "remember" level of Bloom's taxonomy but would be facilitated by understanding the topics more thoroughly after completing all three of Bloom's cognitive levels per topic. The next section will describe the experience from the teacher point of view.

3 PERCEPTION OF THE LECTURER

The expectation of the lecturer was a general relief on the part of the students to be able to work autonomously with increased time in an environment of knowledgeable students, where a lecture could be held on demand in small groups that allowed more questions and interactions and control over lecture times. No longer would a student have to pay attention on demand by the teacher, but vice versa.

In reality, students took a long time to warm up to the new system as they did not ask for lectures during the first weeks but tried to just read the slides. Students were also unable to schedule their own pace through the material despite the fact that the lecturer gave example schedules for various different pathways through the three pillars. Students usually did not resubmit quizzes that did not receive optimal points by instructor through Moodle.

Students sitting in a frontal lecture often seem to subside in an impassionate "coma" not being able to take breaks or rewind. In the new mode, I see students sitting in small groups in front of computers discussing how to solve the given problems. They take breaks when they need them, move their post-it notes to the next level once they have accomplished a level. They collaborate in various sized groups or work on their own with a headset listening to music. They are aware of who is working in a similar area and after some weeks were able to prepare and request frontal lectures in groups of 2-10. These lectures were always given within the three-hour class-time following their demand. During peak time in the middle of the quarter, up to three lectures on different topics where given in one session to various subgroups. These students came prepared, asked questions and gave feedback as to the quality of the lecture, which could then be immediately improved for the next groups.

As a result, motivation for the lecturer has increased. While it would be hard to prove quantitatively, it is apparent in comparison to other classrooms that the questions were asked without intimidation and with more background knowledge and depth. Because of this positive perception on the part of the lecturer, the student perception explained in Section 4 came as a surprise.

4 QUANTITATIVE ANALYSIS OF STUDENT SURVEY

An exploratory survey was conducted to find out what students expect from a good class and how they are motivated in order to receive feedback on the class set up and how well it matches their motivators. The survey was not mandatory and 59 students chose to anticipate in anonymous manner during weeks 8 and 9 out of a total of 11. These responses form the basis of the reported analysis. To get a rough idea about how well the course was received, students were asked to give it a grade. In Figure 2 below, which plots grading of a student for an average frontal lecture minus the grading of Software Engineering on a scale of 1 (best) to 6 (worst), it can be seen that grading for Software Engineering (open format) is about equal (with mean around zero) with a tendency toward preferring the frontal, known style (distribution tends to left side). After years of school training to learn to the test it may not be surprising to see that students will have problems with the new learning environment. Still it was surprising since above mentioned research had suggested otherwise.

The following sections will evaluate the student survey that was designed to elucidate their expectations of a good lecture and their motivators with respect to the research based categories of autonomy, purpose and mastery. The hypothesis was naively that the proposed learning environment was much more closely aligned to their motivators.

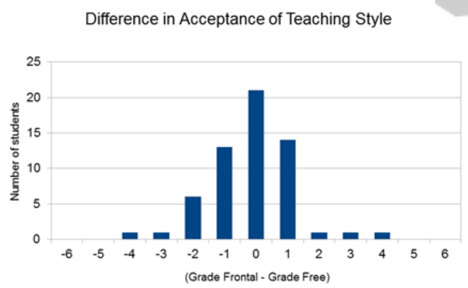

Figure 2: Grade of Frontal - Free Lecture Style.

4.1 Student Profiles

It is of interest to study how students' profiles differ according to how they like each format (frontal vs. Software Engineering). Based on the grades the students gave, they were grouped into "Dislike", giving a bad grade (1 <= grade < 3) and "Like", giving a good grade (3 < grade <= 6) for each format. The resulting number of students in each category is shown in Table 2:

Table 2: Subset of Students with Strong Dis/Likes.

# of students	Like (grade < 3)	Dislike (grade > 3)
Software Engineering	21	19
Average Frontal Lecture	20	9

4.1.1 Perception of Format

Two hypotheses were that students grow to like the format after getting used to it and that prior knowledge would automatically lead to a higher acceptance of the course format.

As expected, students who like the new format noted an improvement of the format over time. However, students who dislike the format alarmingly worsened their opinion over time indicating a lack of necessary scaffolding.

As frontal lecture treats every student the same, whereas the free choices afforded students to move past topics according to their own needs, students with prior knowledge are expected to prefer open style lecture of Software Engineering to average frontal lecture. Strangely, Figure 3 shows that opinion on the course format is not a function of prior knowledge, which as will be seen later, does not suggest a lack of challenging problems.

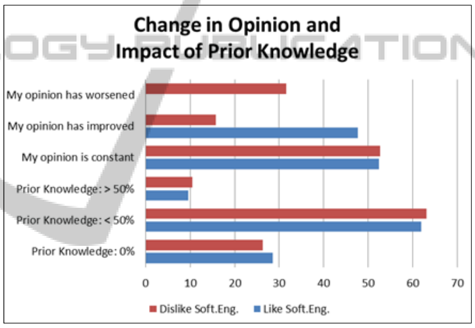

Figure 3: Impact of previous know-how on acceptance of course format and change in opinion.

4.1.2 Students' Expectation of Lecturer

In order to understand the acceptance of the new format, the survey also gathered information on desired characteristics of a lecturer that are perceived as desirable. Due to his point of view and experience, the list given in Figure 4 was designed by a student from the graduating class.

The hypothesis was that a teacher should know how to teach and have expertise both in theory and work experience. Yet, students overwhelmingly answered that it is important to see problems, solutions and obtain a script (in Germany this is a transcript of a lecture, which is more concise than a textbook). This seems to point towards students that are training to the test.

Looking at students' responses in terms of their format preferences, we would expect students who like the Software Engineering open format to put less emphasis on slides and script. This hypothesis is

shown to be mostly supported by the data. However, mostly there is no difference between the groups.
The data revealed additionally, that students who dislike frontal lecture were looking for more for theoretical know-how and practical experience in a lecturer (which they probably did not get since they didn't like the lecture) and to get the necessary content find both slides and textbooks more important than other subgroups (see Figure 5).

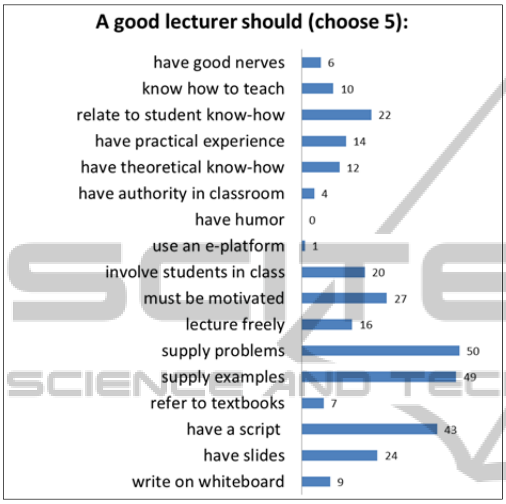

Figure 4: Number of students who choose specific lecture characteristic.

A new hypothesis based on this result is that these students would prefer the free format of Software Engineering. Figure 6 shows that grades given by students show a tendency of anti-correlation between frontal and free style of teaching.

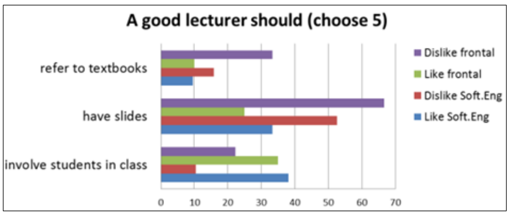

Figure 5: Students' opinion based on subgroups. Numbers are given in % for comparison.

In summary it can probably be said that if the lecturer is good, interaction is important, otherwise the lecturer becomes irrelevant and students seek their information in slides, script and lastly books if necessary – no matter the format of the course.

4.1.3 Students Motivators

Since one of the key design elements of the new format builds on motivating students according to research-based ideas on what motivates humans in general, it is of interest to poll students on their motivators in alignment with the elements in Table 1 above. Under the elements of purpose, mastery, autonomy, and extrinsic (grade) / intrinsic (content) motivation, the questionnaire seeks to explore which elements are motivating for students.

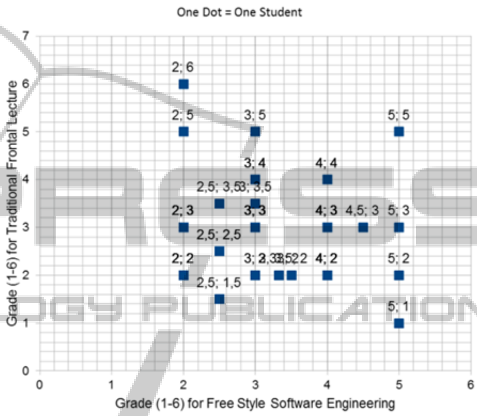

Figure 6: Tendency of anti-correlated grades for frontal vs. free style Software Engineering.

Added categories include challenges and urgency from game mechanics. The original hypothesis that we wanted to explore was whether students can be grouped by motivators that can then be catered to in different teaching styles and with different mechanics.

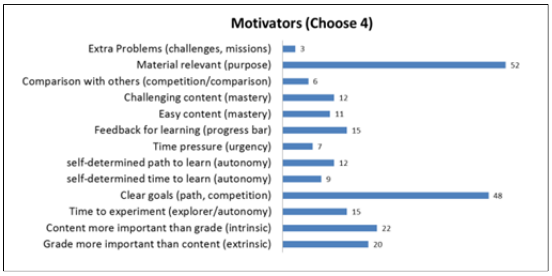

Figure 7: Number of students who voted motivator as important (choosing up to four motivators).

Instead, there was an overwhelming response across all students regarding purpose and path as the main motivators (Fig.7). After asking students, this is to be interpreted within the framework of taking an exam and obtaining a high grade. The clear path refers to receiving material from the teacher that prepares for the exam with the purpose of knowing this material to obtain a good/passing grade. The key is to fulfill the basic needs of staying in the program. Looking at the subgroups, however, there are some clear differences between the two groups with respect to some of the secondary motivating factors. Figure 8 depicts some of the more pronounced differences. Students who enjoy either format (green, blue) like receiving feedback about their learning status. Time to experiment with new material and content tends to be more important for those who like the open style of the Software Engineering course than for any of the other subgroups. This goes along with our expectations but is clearly and strongly overshadowed by the motivators fulfilling the basic needs.

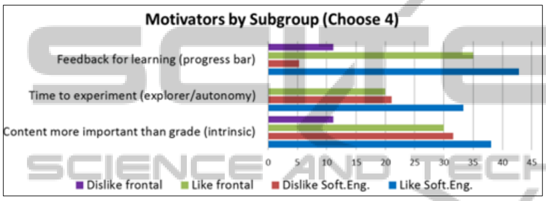

Figure 8: Student Motivators by rating on new format. Numbers are given in % of subgroup.

Because the new format required self-discipline in scheduling the material and a fair amount of team work, another set of questions is designed to find out whether students' dislike of teamwork is related to the dislike of the new format. 80% of those students who enjoy the new format like working in small groups. Only 30% of students who dislike the new format only enjoy working in teams.

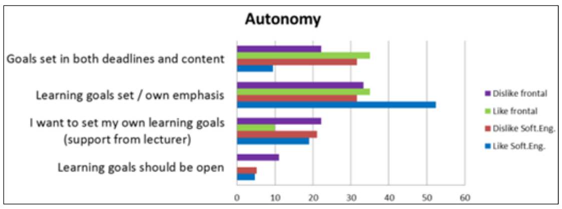

Figure 9: Setting own goals by rating on new format. Results are given in % for subgroups.

The original hypothesis was that most students would welcome the motivation of being able to work autonomously as a relaxing contrast to most of the other "clocked" courses. Figure 9 depicts students' desire regarding autonomy with respect to scheduling of content according to subgroups and supports our hypothesis only for the subgroup of students who like the free style.

4.2 Matching Motivational Factors

Finally, it is important to see how the motivational factors that are important to students match up with their perceived experience of the different lecture styles. In order to understand this, the same questions have been asked about the average frontal lecture in comparison with this particular Software Engineering format in order to see how the results compare.

Questions relate to the three motivators purpose, mastery and autonomy as well as some questions that relate to whether or not the basic needs, such as performing well on the exam, are met. Figure 10 contrasts the replies corresponding to the average frontal lecture when compared to Software Engineering using the new format with numbers given in % of 59 of those students who answered with yes out of yes/no answers possible. While the new format loses on fulfilling the basic need of a student for efficiency and feeling prepared for the final exam, the new format wins on aspects of lecturer adapting to individual needs, students wanting to understand the material and granting autonomy. Still, with either format there is not enough time to master the material properly.

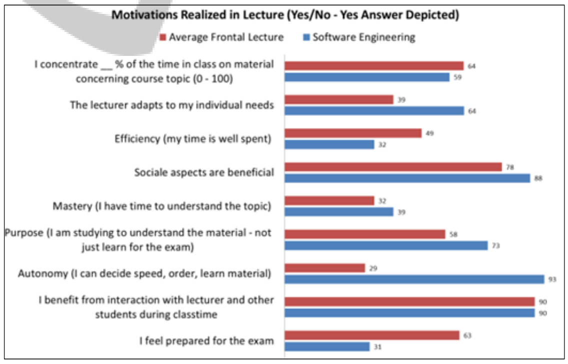

Figure 10: How well are motivators fulfilled in frontal lecture and new format classroom?

Figure 11 shows how opinions differ for each of the four subgroups to gain a more detailed understanding of the results. More students who like the new format feel that the lecturer adapts to their individual needs. Students who dislike frontal lectures or like the new format tend to be more interested in studying to understand the material (mastery) rather than learning just for the exam. Students with strong feelings either way about the new format agree that the new format grants more autonomy with respect to speed and order of the material. On the other hand, students who have strong feelings about frontal lectures strangely do not perceive autonomy granted by new format. It is possible that autonomy may be perceived negatively as being forced to work during class time.

Looking back at the analysis that shows that the primary motivator was to fulfill the basic needs of staying in the program with good grades, it is especially disturbing that students who do not like the new format are especially concerned about the efficiency of in-class time when compared to frontal lectures.

Despite individual feedback on their performance using online quizzes throughout the semester, most students regardless of subgroup, tend to feel less prepared for the exam when compared to a frontal lecture. After conferring with students on this finding, it seems that the reason for this are the open problems, no clear script to follow and more than one correct answer for the higher level problems, which makes it very difficult to know when preparation for an exam has ended. This mismatch of basic needs and fulfillment is problematic.

5 QUALITATIVE ANALYSIS OF STUDENT FEEDBACK

General student qualitative feedback, especially for those that struggled with the new format reflected three major areas: 1. the importance of knowing how to obtain a good grade, 2. the difficulty of on-boarding in this new learning style, 3. the lack of supporting material even after buy-in to the new format.

5.1 Open Questions vs. Clear Answers

The importance of the exam and the grade and as a result the desire for clear "structure" - meaning that the lectures should be very exact in preparing the student for the exam by clearly covering necessary material, sample questions and corresponding answers that are known to be correct is clearly the equivalent of the basic need that should be fulfilled given the students' "ecosystem" at the University. This student goal is diagonally opposed to the inability to memorize the correct answer to a question like:

"List and weigh important criteria when selecting a supporting tool for Lifecycle Management. Then compare two tools of your choice and argue your final choice based on your chosen criteria and assumptions." While this may be a real-life question

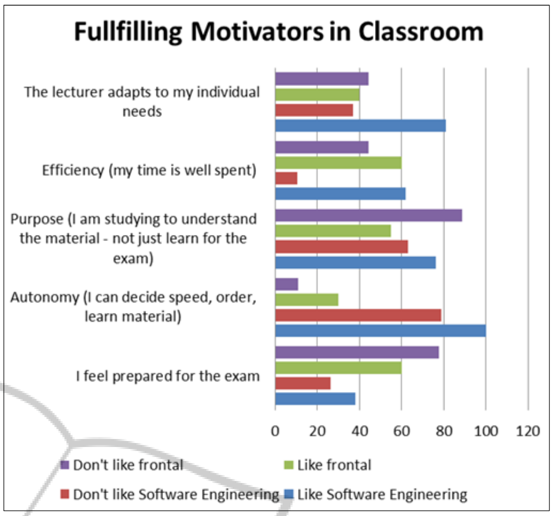

Figure 11: Contrasting how motivators are fulfilled in Software Engineering for all different subgroups (in %.).

as it would be posed in the workplace, it is not a "good" exam question (like "What does UML stand for?") as it does not have a single correct response that could potentially be memorized. A good answer would reflect how much time a student has spent looking at what Lifecycle Management is (information given in a lecture), what kinds of processes it can support (lecture) finally what types of tools and capabilities are available on the market and which features distinguish these (research on the web with provided links to start). The student has to be able to analytically formulate criteria based on assumptions that are important to a project and with those in mind compare a number of tools. This requires analytical thinking and transfer of know-how to unknown situations, an important skill with constantly changing tools in information technology. There is no correct answer and assumptions have to be stated as part of the answer to the question. Yet, results from this work show a clear need for facilitating the move towards answering these kinds of questions.

5.2 On-boarding

Key take-home message from feedback of all students is that the on-boarding process, the steps from frontal lecture to free learning has to be gradual and guided. Students had problems with

- scheduling their own work
- asking for lectures on demand
- using the platform to their advantage (taking quizzes regularly, improving answers upon feedback, contacting expert students for help)

- leveraging in-class time (collaboration, lectures)
- understanding that a question has more than one correct answer

Feedback clarified the need for providing more scaffolding at the beginning of the class and removing these at rates depending on the individual student. One of the questions on the questionnaire asked students how they could have taken better advantage of the new format of learning. It is remarkable to note that only around five students were able to reflect on their own ability to cope with the new format. The importance of acknowledging such difficulties and the need to "[…] intentionally articulate[…] and foster[…] self-reflection and awareness of processes important to learning such as self-efficacy" (Shea, 2010, p. 1727) has been documented in the literature.

5.3 Learning Material

Due to the misunderstandings of how students relate to the materials that are given in the classroom, all material has to be reviewed to support more self-study and rely less on interaction between lecturer and student. It has to be clarified that slides are not meant to be stand-alone material. They cannot replace reading a textbook, which is how students expect to use them. Scripts in form of related books need to be made more explicit. Problems have to be more structured and even more explicitly marked as closed form vs. open form answers based on inference or analytic thinking. There were four different platforms used for the first couple of weeks before settling on two. A single platform, even if suboptimal, is essential.

6 CONCLUSIONS AND FUTURE WORK

A software engineering course was redesigned to sort topics into paths and cognitive levels, game mechanics were added and tools used to support some of those mechanics to include motivators into the classroom that are well known in the literatures. Results showed that the primary needs for students in a restricted grade-based environment were not met in the given setup. Change management has to be incorporated into the course to improve acceptance beyond the type of student who is ready for this new format.

The following changes are proposed based on the findings: In order to survive, the design of this course has to take into account the surrounding ecology that is heavily grade-based and time-constrained. It is necessary to meet the basic needs of the students to make the path to good grades clear (Maslow, '43). Yet, making this path too easy to obtain more time to spend on deepening understanding may cause other parts of the ecosystem (other classes) to infringe on time that is superfluous according to students' goals. Portfolios that count toward points on the exam may be part of the solution.

Students feel that they have no overview over all necessary and important areas of study. While they will acquire knowledge in all areas during the course of the third quarter, this was reportedly uncomfortable. Giving an overview lecture of the nine areas of study is very important. While students were worried about missing something, only two attended all nine lectures on their own accord.

The increasing difficulty due to increasing openness of problem statements within Bloom's taxonomy has to be made explicit through improved material and increased scaffolding showing example answers and arguments for all levels. In combination with the known need by employers for this capability, there is a clear need to manage this change in most students' manner of working and acquiring higher-order thinking skills.

The study showed clearly that the semantics behind motivators such as autonomy, purpose and mastery are defined differently for students. Mastery relates to memorizing material for an exam in such a way as to receive a good grade. Autonomy means that a student is able to not participate during class time and choose their own time for learning. Purpose is to receive the necessary grades to obtain a Bachelor degree to obtain a good job. These terms have been defined throughout prescriptive school, University and life in society that expects diplomas. Even phases on the job within their time of study have not had an effect on these definitions by the time students reach their second year of study. Further study is necessary to find out whether this perception will change before the Bachelor is obtained. In order to manage this change of perception it may be necessary to include employers' in this dialogue by inviting them to class.

Future work includes reporting on the proposed changes and further feedback to be collected from the present group to find out long-term effects of the learning experience after the end of second semester.

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REFERENCES

Bekele, T. A. (2010). Motivation and Satisfaction in Internet-Supported Learning Environments: A Review. *Educational Technology & Society*, *13* (2), 116–127.

Bloom, Benjamin. *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. New York: David McKay, 1956.

Charles, T., Bustard, D. and Black, M. (2011). Experiences of Promoting Student Engagement Through Game-Enhanced Learning. *Serious Games and Edutainment Applications*, 425-445.

Deci, E. L. and Ryan, R. M. (2012). Overview of self-determination theory. The Oxford Handbook of Human Motivation, 85.

Derntl, M. and Motschnig-Pitrik, R. (2005). The role of structure, patterns, and people in blended learning. *The Internet and Higher Education*, *8*(2), 111-130.

Gagné, M. and Deci, E. L. (2005). Self□determination theory and work motivation. *Journal of Organizational behavior*, *26*(4), 331-362.

Garrison, D. R. and Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, *7*(2), 95-105.

Goel, S. and Sharda, N. (2004). What Do Engineers Want? Examining Engineering Education through Bloom's Taxonomy. *Online Submission*.

Graham, C. R. (2006). Blended learning systems. Handbook of blended learning: Global Perspectives, local designs. Pfeiffer Publishing, San Francisco, http://www.publicationshare.com/graham_intro. pdf.

Hall, S. R., Waitz, I., Brodeur, D. R., Soderholm, D. H., and Nasr, R. (2002). Adoption of active learning in a lecture-based engineering class. In *Frontiers in Education, 2002. FIE 2002. 32nd Annual* (Vol. 1, pp. T2A-9). IEEE.

Heidenreich, K. (2011). Erwartungen der Wirtschaft an Hochschulabsolventen. DIHK, Berlin.

Kearsley, G. (2000). *Online education: learning and teaching in cyberspace*. Belmont, CA.: Wadsworth.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into practice*, *41*(4), 212-218.

Lepper, M. R., Henderlong, J. and Gingras, I. (1999). Understanding the effects of extrinsic rewards on intrinsic motivation—Uses and abuses of meta-anlysis: Comment on Deci, Koestner, and Ryan (1999).

Lynch, R. and Dembo, M. (2004). The Relationship Between Self-Regulation and Online Learning in a Blended Learning Context. *The International Review Of Research In Open And Distance Learning, 5*(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/189/271

Maslow, A. H. (1943). A theory of human motivation. Psychological review, 50(4), 370.

McGonigal, J. (2012) Reality Is Broken: Why Games Make Us Better and How They Can Change the World. Penguin, London, 2011.

Mohammad, S. and Job, M. A. (2012). Confidence-Motivation–Satisfaction-Performance (CMSP) Analysis of Blended Learning System in the Arab Open University Bahrain.

Pink, D. H. (2010). Drive: The surprising truth about what motivates us. Canongate.

Rebitzer, J. B. and Taylor, L. J. (2011). Extrinsic rewards and intrinsic motives: Standard and behavioral approaches to agency and labor markets. *Handbook of Labor Economics*, *4*, 701-772.

Rheinberg, F. (2006). Intrinsische Motivation und Flow-Erleben. Motivation und Handeln, 331-354

Schober, A. and Keller, L. (2012). Impact factors for learner motivation in Blended Learning environments. *International Journal Of Emerging Technologies In Learning (IJET), 7*(S2). Retrieved December 7, 2012, from http://online-journals.org/i-jet/article/view/2326

Scott Rigby, C., Deci, E. L., Patrick, B. C. and Ryan, R. M. (1992). Beyond the intrinsic-extrinsic dichotomy: Self-determination in motivation and learning. *Motivation and Emotion*, *16*(3), 165-185.

Seligman, M. E. and Csikszentmihalyi, M. (2000). Positive psychology: an introduction. American Psychologist; American Psychologist, 55(1), 5.

Shea, P. and Bidjerano, T. (2010). Learning presence: Towards a theory of self-efficacy, self-regulation, and the development of a communities of inquiry in online and blended learning environments. *Computers & Education*, *55*(4), 1721-1731.

Thompson, E., Luxton-Reilly, A., Whalley, J. L., Hu, M., and Robbins, P. (2008, January). Bloom's taxonomy for CS assessment. In *Proceedings of the tenth conference on Australasian computing education-Volume 78* (pp. 155-161). Australian Computer Society, Inc.. Tuan, H. L. and Chin, C. C., & Shieh, S. H. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, *27*(6), 639-654.

Zichermann, G. and Linder J. (2010). Game-Based Marketing: Inspire Customer Loyalty Through Rewards, Challenges, and Contests. Wiley, Hoboken, NJ, 2010.