

# HIS – AN INTERNATIONAL AND DIGITAL SUMMER SCHOOL FOR STEM STUDENTS

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## Abstract

The teaching project HIS (Holistic International STEMs – Learning with case studies and real life industry experiences) is presented as part of the poster session.

Experience shows that German (outgoing) and international (incoming) students have difficulties to communicate properly at the workplace in Germany as well as abroad due to language differences, especially in STEM terms. In addition, young professionals often do not have experience in working in international or virtual teams. All those challenges are current job requirements, not just in global companies. But: How to teach this in higher education? The classical formats of lectures or seminars are not suitable. Therefore, there is a need to develop and prove new teaching formats, within the curriculum as well as extracurricular.

With focus on STEM subjects the presented project combines three current impacts on higher education: Internationalization, digitalization, and labor market orientation.

The concept of the project is that STEM students from different countries will attend an international, virtual summer school (April to June 2016). They solve real-life job case studies together in small interdisciplinary teams. The participants are mentored by national and international industry partners and STEM professors. With such, the participants will improve language and communication skills, and apply and exchange their expertise as well as gain intercultural work experience.

The concept was awarded by the “Stifterverband für die deutsche Wissenschaft” (Donors' association for the promotion of humanities and sciences in Germany).

The poster introduces the project and exemplify the three-dimensional assignments of one case study (occupational, lingual, and intercultural). At present, the project should be handled as a “project in progress”.

Keywords: technology, teaching projects, STEM, internationalization, digitalization, labor market orientation, employability, job orientation, competencies, development of new curricula

## 1 INTRODUCTION

The European university and higher education system is changing. Currently, three particular trend clusters dominate the discussion on the role of universities in modern knowledge societies:

- Internationalization, globalization, mobility, migration
- Digitalization, digitization, computerization, open education
- Labor market orientation, employability, capabilities, competencies, job orientation

All three areas can be found and are of central importance in higher education policies: In public tenders, funding priorities of universities and also in the strategic orientation of educational institutions and universities. However, the aspects are hardly discussed together, especially not when it comes to teaching and teaching methods [1].

Kehm, Schomburg, and Teichler [2] note that the aspects do currently not imply a big plan or an overall complete change, but can be found in numerous discussions and in a variety of activities in search for new solutions.

The presented HIS project is one of the outcomes of such search activities and discussions at the Technical University (TU) Bergakademie Freiberg in Saxony, Germany. The main goals of HIS (Holistic International STEMs - Learning with case studies and real life industry experiences) are internationalization, digitalization and labor market orientation with the aim to capture these aspects in their interconnectedness and to implement them into a practical teaching-learning scenario. The

project aims to trigger new ideas to university teaching and to the development of new curricula - internally within the university as well as externally with industry partners.

The following article will explain the development of the program, the main idea, and will address the objectives of the project. The poster and the article are a preliminary workshop report. Comments, ideas, or requests for collaboration are most welcome.

## 2 CURRENT SITUATION

Only the terms internationalization, labor market orientation, and digitalization will be considered in the poster as these aspects are the most commonly considered aspects. Often, the terms are used as empty placeholders and melodious ciphers in project proposals or university visions. Their importance and the resulting specific implications are often unclear. Public policy does not clarify it either: On the one hand, creativity, personal initiatives, and the development of customized, flexible teaching and learning settings are emphasized. On the other hand, the recent Bologna reforms focus on formalization and quantification of curricula. In the following, the three aspects are generally and with a distinct focus on the HIS project introduced.

### 2.1 Background

#### 2.1.1 *Internationalization*

Internationalization of higher education is not a new phenomenon. Higher education institutions were always international. Since the Middle Ages students traveled towards renowned teachers and to schools abroad [3].

With globalization, modern transportation means, and the constant availability of information on the Internet, not only the mobility of students and teachers has reached a new dimension, but the phenomenon has become even more complex. As a result, international education and the possibilities seem to be limitless, but also confusing. De Wit noticed already in 2002 that the term internationalization is a "catch-all phrase for everything and anything international" [4]. However, internationalization can be divided into three levels:

At the **strategic** level, internationalization serves as a leitmotif of higher education policy and university management to adequately meet the trends of globalization [5]. This includes

- Both culturally and idealistically, e.g., a university as a meeting place, an intercultural educational institution, a place for ideas on how to form societies,
- Structurally, e.g., the shared use of resources, knowledge collaborations, and
- Monetary aspects, e.g., the strengthening of competitiveness of higher education systems, external funding, student and science marketing.

At the **conceptual** level, internationalization is an explicit and / or implicit process that is reflected in all core areas of the university (research, teaching, and services). Specific internationalization projects are realized in the individual areas of a university. In teaching, this means, for instance [5] [6]:

- Introducing international courses,
- Developing inter-university teaching formats,
- International curricula (content and structure),
- Teaching in two or more languages (English as a lingua franca),
- Preparing for international job assignments,
- Integrating digital media in, for instance, the organization and carrying out of study programs
- Developing meaningful offers for extracurricular and additional professional training such as
  - o Intercultural knowledge and intercultural practice,
  - o Use of digital media.

On the **individual** level, the personal motivation of teachers and students plays an important role. However, as motives are very diverse, they will neither be covered in the poster nor in the article.

Within the HIS project, the aspect of intercultural exchange as a part of internationalization is especially emphasized. Recently, the term European internationalization is found with reference to a specific type of interculturalism that has long been disregarded due to the common cultural area of Europe. Altbach and Knight [6] argue that the denotation started only in recent years and because of the South-North migration when young people from the southern hemisphere countries migrate to the

states of the northern hemisphere for education and training purposes as well as the international business of companies in countries and emerging markets of the southern hemisphere for lower production costs.

In the HIS project, internationalization refers to the following aspects:

- The HIS project is not about integrating of migrants, but about a two-way exchange of students (incoming and outgoing) beyond the European region.
- Intercultural exchange does not happen by chance, but needs to be didactically provoked and reflected.
- Language and media are both learning content as well as learning material.

### 2.1.2 Labor Market Orientation

A change of the functions [7] of German universities is highly discussed not just since the Bologna reforms: Economization, standardization, or the ideals of higher education (Humboldtian model of education)? The fact is, that universities were always and still are places of academic training, both professionally and humanly - despite recent developments such as digital technologies in international and intercultural teams or interdisciplinary problems.

However, the labor market for academics and international companies not only requires technical knowledge and practical skills of the university graduates, but also an interdisciplinary approach, a willingness to take responsibility and competence, decision-making abilities, teamwork, flexibility, intercultural competencies, etc. [8].

Therefore, universities nowadays try to implement competency trainings and practical trainings. However, the success of such programs will not be seen overnight [9] [10] [11]. The rephrasing of teaching objectives in learning objectives in module manuals is not sufficient enough given that the traditional teaching formats and curricula are well-proven despite being too bogged down. Therefore, there should not be complete new concepts, but rather useful supplements.

Similarly to the aspect of internationalization, three levels of labor market orientation were developed:

At the **strategic** level, labor market orientation is a double-edged concept in higher education policy: On the one hand, an orientation of higher education objectives (output) to the needs of the economy, but in a broader sense (outcome) a holistic, competency-based training.

**Conceptually**, labor market orientation mainly reflects in the area of teaching. It is about a practical content and the strengthening of holistic, interdisciplinary, informal, and intercultural courses:

- A greater focus on internships,
- Interaction with praxis, e.g., case studies and lectures with practitioners, excursions,
- Practical presentations of the content (project work, problem and solution oriented presentations),
- Increase of student activities and initiatives,
- Testing of new formats,
- Focus on problem-based learning.

At the **individual** level, it can be assumed that students have a self-interest to shape their personal education according to the requirements of the labor market. For university teachers, it mostly depends on their personal didactic interests as well as their self-perception as a teacher or researcher.

Within the HIS project, labor market orientation is the central theme. HIS is about real life requirements, professionally and beyond. However, in addition to the components of exchange and fusion of, for instance, knowledge, communication, and interaction, demarcation is important. Demarcation is especially important in terms of developing the students' personal professional identities, discovering their personal workplace strategies, and recognizing their strengths and weaknesses.

### 2.1.3 Digitalization

Compared to internationalization and labor market orientation, digitalization is a relatively young field, particularly when it comes to the usage of digital media at conventional universities [12]. Nevertheless, modern information and communication technology means are standard in today's university administrations as well as in e-learning. In the U.S., 33.5% of the university courses were digital in

2012. The University of Hagen in Germany, which is an e-learning only university, was the university with the highest number of students in winter semester 2014-15 in Germany [1].

Digitalization at universities namely covers these three levels:

- Subject: Scientific examination of technologies, the question of information and communication technology in education itself, sociocultural conditions, legal implications,
- Method: Systematic review and reflected use of media for knowledge discovery, communication, and collaboration, and
- Service: Provision and maintenance of digital tools and services.

The term digitalization has two implications: At the operational level it is a technical term for the transformation of analog signals into digital signals and refers in this regard to the term digitization [13]. At the **strategic** level, digitalization refers to the increasing usage of information and communication technology in organizations. When it comes to the strategic level of higher education policy and university management, digitalization is, however, merely a response to extrinsic computerization and technological change instead of an active intrinsic motivation of universities.

Nevertheless, digitalization affects all areas of a university. **Conceptually**, and in terms of teaching, digitalization is about:

- Integrating digital media into teaching,
- Flexibility of learning (temporal and spatial independence),
- Creating personal learning environments,
- The idea of education and free access to teaching and learning materials,
- Promotion of mobile capabilities and accessibilities.

At the **individual** level, the use of digital media in teaching often depends less on the content or the possibilities, but rather on the personal usage preferences and the personal learning biographies - which applies to both teachers and learners. Often, teaching purposes are seen separately from work purposes and research purposes. While digital media are used quite naturally in the latter two, their advantages are often not perceived in teaching (I teach as I was taught).

Within the HIS project, the use of digital media follows the aspect of usefulness for distance cooperation, distance collaboration and on the basis of working conditions and working tools in the respective professional community.

#### 2.1.4 STEM

STEM subjects are perhaps not a direct trend cluster, but are strategically relevant for higher education policy and universities. In particular, these subjects are important drivers of innovation in knowledge-based societies and set trends themselves. Therefore, there are a number of initiatives to reduce the number of student drop-outs in STEM subjects or also to introduce more women to these subjects. Within the HIS project, the STEM subjects are rather a content frame. It was deliberately opted for STEM subjects as it corresponds with the focus of the TU Bergakademie Freiberg and as there are already existing inter-curricular connectors to economic or social sciences subjects.

## 2.2 Initial Situation at the TU Bergakademie Freiberg

The TU Bergakademie Freiberg is the only German university with a single distinct focus on sustainable materials, natural resources, the energy economy, geosciences, and the environment. The STEM disciplines science, technology, engineering, and mathematics are the core research and teaching subjects of the university. The TU Bergakademie Freiberg is rooted in a 250-year-old history, but actively focuses on today's and the future's challenges of the supply of resources along the entire value-added chain. Teaching and research conditions at the TU Bergakademie Freiberg are state-of-the-art due to various endowments, foundations, and numerous partners in industry.

As ongoing surveys amongst current students constantly show, the study programs are highly valued due to their special adaptations to the professional requirements of the job market and praxis [14].

As an internationally oriented university since its beginnings, the TU Bergakademie Freiberg is currently further strengthening its international strategy. As of 2014, 13% of the total number of 5,304 students were foreign students, coming from diverse countries such as China, Vietnam, Russia, Ukraine, India, and Brazil [15].

Nowadays, it is almost standard that German students spend semesters abroad at, for instance, one of the more than 32 partner universities of the TU Bergakademie Freiberg [16]. The majority of the international graduates of the TU Bergakademie Freiberg have returned to their home countries, but some also seek employment in German firms first. Experience shows that opportunities to improve the intercultural atmosphere and language skills of employees, the ratio of foreign students, the professional orientation of Germany for international students, the provision of international mobility support for young scientists as well as the outgoing rate of students within the context of exchange programs and the internationalization of the study curricula show potential to be improved further [17]. The aim of the HIS project is, thus, to holistically develop and train the linguistic and intercultural competencies of students for both study and employment, locally and internationally.

Digital media and e-learning serve as important and essential tools in today's interdisciplinary and international university education since no international activities would be possible without digital online content. The TU Bergakademie Freiberg is a classic brick-and-mortar university based on quality criteria such as a close relationship between teachers and students and a clear focus on practical teaching. These quality criteria are equally met in the e-learning and digital concept of the TU Bergakademie Freiberg: Online and e-learning tools are implemented to enhance and support the teaching and learning experience of the students [18]. The HIS project will complement the already established structures and further highlight the opportunities that the TU Bergakademie Freiberg offers to its national and international prospective and current students.

### 3 GOALS AND VALUE OF THE HIS PROJECT

After introducing all three aspects individually, the project goals will now be explained on three levels within their context of the HIS project (figure 1):

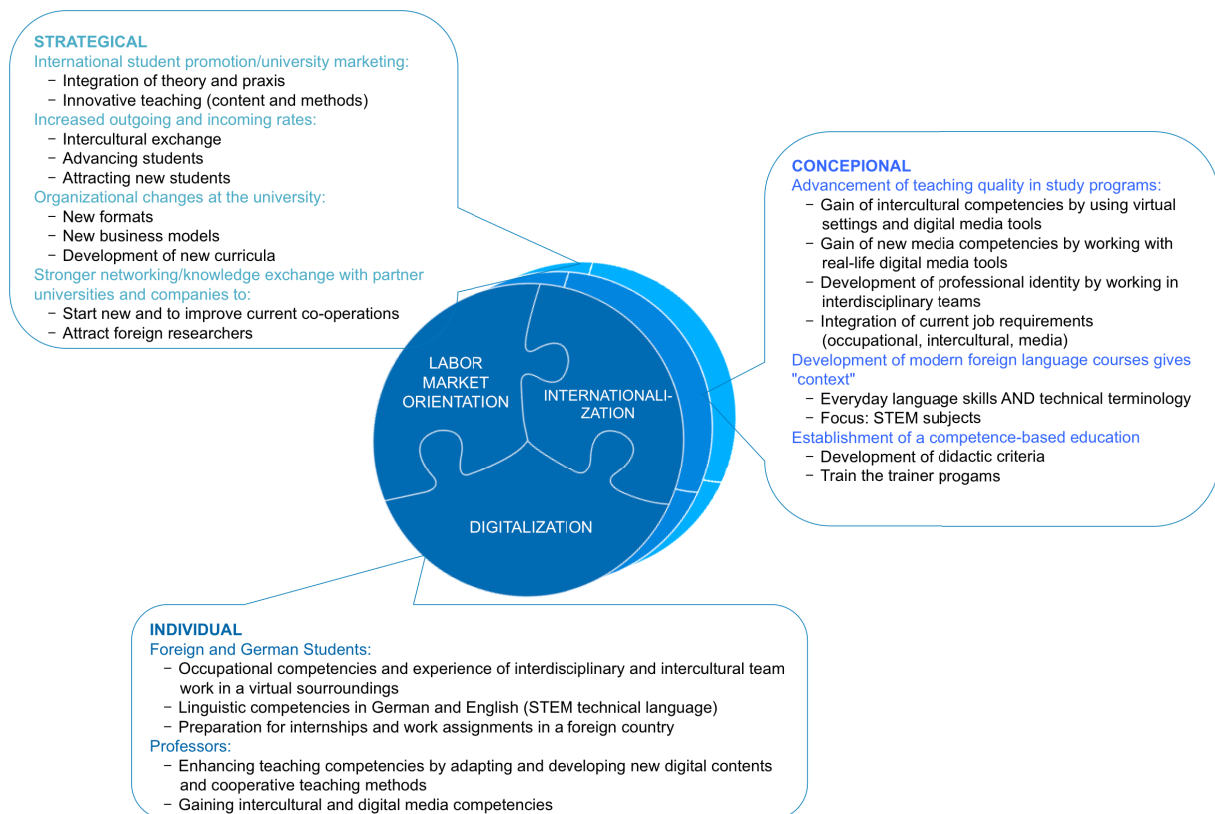


Figure 1: Goals and Values of the HIS project

Also local and international companies will greatly benefit from the graduates of the program.

## 4 HIS PROJECT OUTLINE

### 4.1 Main concept

Goal:	Testing and evaluating new teaching formats in higher education according to current trends like internationalization, digitalization, and labor market orientation
Concept:	<p>International STEM students with the intention to come to Germany for or during their studies and German STEM students planning to work or to study abroad meet in a virtual summer school (9 weeks). They solve case studies together in small international and interdisciplinary groups. The case studies are based on real life events and experiences of national and international industry partners representing the STEM industries (e.g., GlaxoSmithKline, akili:innovation GmbH, SEM Fire and Rescue). In each case a specific work problem is introduced.</p> <p>An e-moderator or e-coordinator and e-tutors are available as general contact persons. They assist in technical and methodological matters as well as moderate large group meetings. There are STEM professors and representatives of the companies as consultants available for technical support (limited number of consulting hours per case study).</p>
Learning objectives:	Goals from the perspective of the students: Preparation for working in intercultural and interdisciplinary teams, obtaining job-related specialist language skills (English), learning of appropriate behavior and strategies for the future workplace, dealing with information and communication technologies, introduction to methods of project and knowledge management
Term:	The team project starts with the online kick-off event in the 15th calendar week (11/04 – 16/04) in the summer semester 2016 and ends with the online final event (presentation of results) in the 23rd calendar week (06/06 - 10/06) of the summer semester 2016.
Place:	Virtual – communication and exchange via the learning management system classrooms and various free tools

### 4.2 Implementation

#### 4.2.1 Format and Methods

The Summer School will take place as a semi-open online course. Semi-open since there will be a public and a protected area. In the public area there will be:

- The project ideas and presentations. There will be possibilities for public discussions. External participants are encouraged to take part in web conferences, chats, or forums.
- Work results, e.g., glossaries on topics or specific topics, materials, expert interviews.
- Certain practical language tasks.

Depending on the interests and activities of the external participants there may be participation certificates.

The work on the case studies and the exchange within the groups will be held on the learning platform or in private conferences in a protected area. Used tools will be:

- Shared information, organization and interaction base: Course in an e-learning management system, up to 30 tools available (wiki, glossary, link list, forum, blog, appointments, allocation of topics, mail, calendar, etc.).
- Handling and presentation of case studies with Adobe Connect (group meetings, expert discussions, etc.).
- To document the personal learning progress, in particular, in the field of intercultural learning: e-portfolio.
- In addition, it is optional for the participants to use their personal communication channels (email, phone, social media, instant messaging, etc.).

## 4.2.2 Teaching Methods

Main methods will be case study work in virtual groups as well as portfolio work as independent self-studies with media.

### **Case Studies:**

Training with realistic cases not only teaches encyclopedic knowledge via practical and appropriate real-life problems, but also applies such knowledge in team work. It also opens up the complexity of practical problems. The actual outcome for the students is to apply their knowledge and learn, in a playful way, what to expect in their future work life.

The case studies and case study assignments have been developed three-dimensionally: Occupational, lingual, and intercultural. It is not just a question of understanding and to solve technical problems in their interdisciplinary and complex matter, but also to try working as a team (roles, knowledge, communication), to learn and to apply project management methods, to develop personal knowledge discovery methods and to work with instruments and tools found in praxis. Students are able to work in real-life conditions on the cases.

Case studies are a proven method in education, especially in medical, legal, and business study programs [19]. However, in STEM subjects, teachers are partly reluctant to use case studies since

- Curricula are so closely knit that there is often no time to depart from the conventional teaching methods,
- Exercises have a higher priority than new practical experiments,
- The construction of case studies is time consuming and partly difficult,
- There is a lack of internal and external support,
- In Bachelor level courses the related basics are taught first and teachers shy away from preliminary interdisciplinary work.

Similarly, at the TU Bergakademie Freiberg these reservations have been discussed. However, test courses show that participating students and industry partners alike emphasize the efficiency and effectiveness of the method [20]. Now, the approach is broadened for an international audience.

The case studies will be solved in virtual group work. With such, the problem-solving in virtual and joint team work is already a pre-employment simulation. Virtual teams are a fact in everyday work life in international business enterprises and are no longer perceived as insufficient, but rather as a valuable addition to face-to-face team work [21]. Therefore, the virtual and intercultural team work and the use of various synchronous and asynchronous freely selectable tools will create ample opportunities to improve informal and formal learning.

### **E-Portfolio:**

The e-portfolio is a virtual binder for collecting data. The portfolio concept and the associated methods began in the field of education in the late 1990s [22]. With the e-portfolio, learning outcomes or products (so-called artefacts) are thematically collected, systematized, and reflected. This can either be entirely self-controlled (performance or application portfolios) or passed through a task / assignment (internship or course portfolio). The portfolio is considered to be competence-oriented as it marks a shift in perspective from income to outcome [23].

In higher education, the portfolio method is used primarily in educational and social science courses. Most recently, the portfolio method is also slowly introduced in the STEM subjects. In the past, it was not used due to a lack of knowledge of teachers and students about this method, lack of time for trying new methods, complicated corrections, and lack of technical and didactic know-how.

Portfolio and e-portfolio work has already been used at the TU Bergakademie Freiberg [8]. In 2013, it was examined how e-portfolios may measure the personal development and skill development of students. The students documented their extracurricular and interdisciplinary activities (courses, working groups, projects jobs). Students stated that this process was a helpful documentation and assessment for them for, for instance, applications, career orientation, etc.

In the HIS project, the portfolio will help the students to reflect their personal learning progress as well as the interaction within the team with a focus on intercultural exchange. In terms of a scaffolding approach, the moderator will give individual feedback to the portfolio. The aim is to reflect implicit actions, reactions problems and conflicts and, thus, to trigger an active intercultural confrontation.

The portfolio of the project is in electronic form. It is a part of the online platform and separated from the course. Students work with the e-portfolio alone and, hence, this social form differs from the case study. This different method was deliberately chosen to implement media-supported self-study.

The processing of the e-portfolio is compulsory, but its content is separated from the exam of this course.

#### 4.2.3 Organizational Aspects

The summer school is an official course at the TU Bergakademie Freiberg. The work load is considered to be 90 hours (3 credit points). Students not being able to receive credits due to their curricula will receive a certificate. International students of other universities will be reviewed individually in order to potentially award credit points.

#### 4.2.4 Actors and Roles

While preparing the course, the roles and responsibilities within the project were partly unclear to the professors and industry partners. Therefore, it was opted for an actor and role model (figure 2) for the implementation of the pilot project.

**Actors:** In addition to the coordinators, actors are STEM professors at the TU Bergakademie Freiberg and foreign universities, cooperating STEM companies, and students. During the preparation of the project, the coordinators contact only STEM professors and companies. The STEM professors support the coordinators by attracting local or international students to the project. Contact with STEM professors from other (international) universities is established through STEM professors of TU Bergakademie Freiberg.

**Roles:** During the pilot project, the actors use their assigned roles. The coordinator conducts and moderates the pilot project as a moderator. In addition, there are e-tutors answering the questions of the participants regarding the e-learning tools and the course in the learning management system. Furthermore, they support the group processes within the teams. While the students work on the case studies, the STEM professors and employees of international companies act as consultants on the cases. The consultants answer the upcoming technical questions of the participants during the case study work.

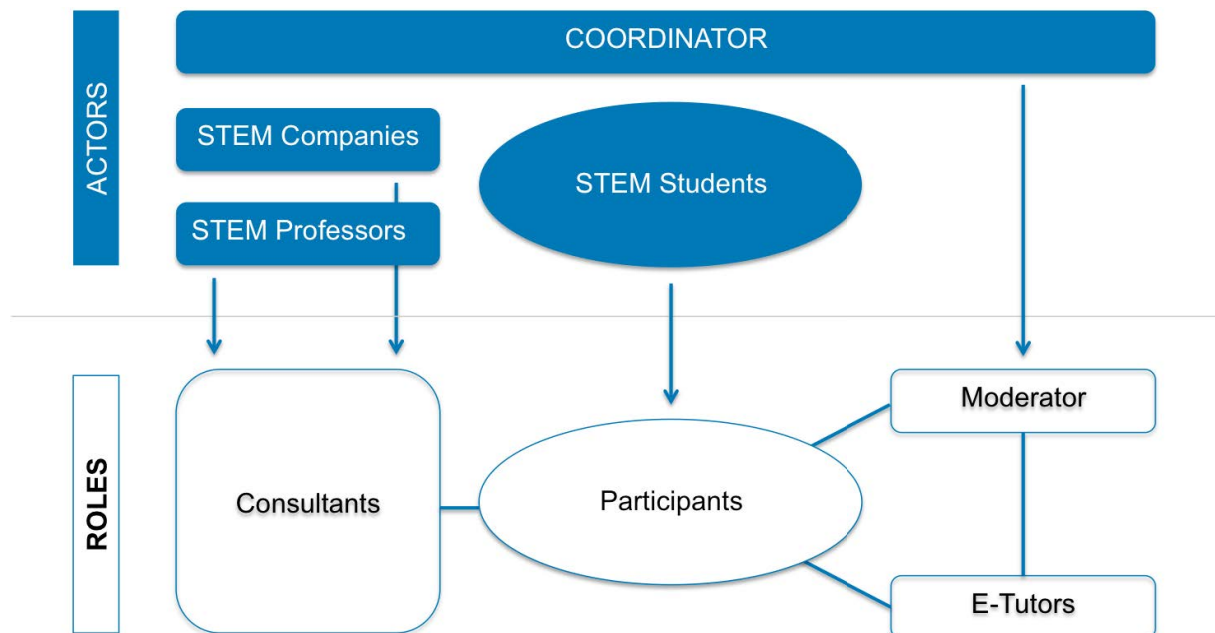


Figure 2: Actors-and-Roles-Model of the HIS project



### 4.3 Schedule

The summer school is divided into three phases (figure 3): Preparation (1), Working on the case studies (2) and Follow-up (3).

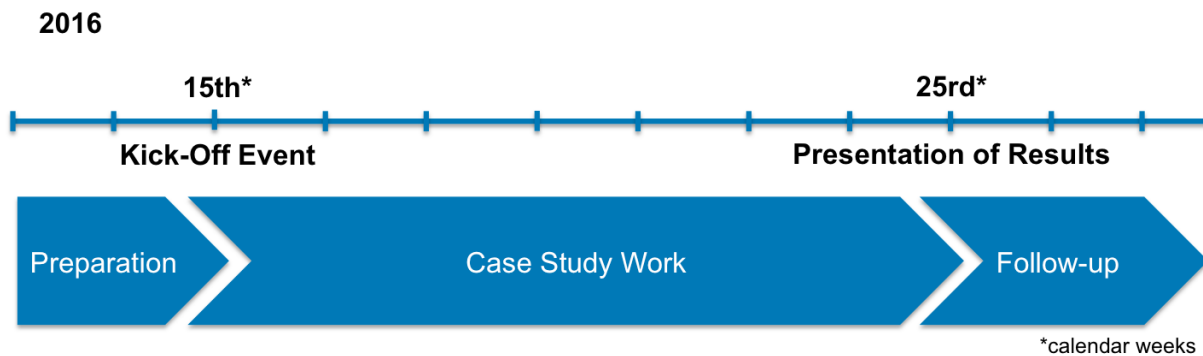


Figure 3: Schedule of the HIS project

During the preparatory phase, the participants, the professors and the advisors are individually introduced through e-tutors to the tools to be used. The case study processing phase begins with a public virtual kick-off event. The case studies will be allocated to the students and experts (as in every project a certain level of expertise is required, the coordinator will take charge of this in the pilot project).

In order to promote team building within the group right from the beginning, there will be test assignments prior to the concrete case study work. The division of roles within the teams is neither specified nor allocated by the coordinator to promote the team members to work together.

The consolidated teams then start with the case study work. Initially, the team needs to analyze the task and information given in the case study framework. This leads to the main topics for the search for information and tasks that are distributed within the group. In order to reach optimal knowledge contribution, the group will be encouraged to reflect and use the expertise of the individual team members. After that, this result will be publicly (virtually) presented and defended in the presence of an adviser. The presentation of the results is already part of the exam, which is required to set off the module. In addition to giving the presentation, the presentation slides and the individual documentation / e-portfolios of the work need to be handed in.

It is also very important that the project does not abruptly end after the case studies. It is rather encouraged and emphasized that the students use the established networks to other students and industry partners further for, for instance, to organize a stay abroad or to do an internship or even future employment.

## 5 DIFFICULTIES / CURRENT WORK IN PROGRESS

In conclusion, the HIS project offers numerous starting points for open discussions and scientific investigations - organizationally, didactically, etc.

Currently, the following sub-projects are being examined and discussed:

- Creditability: Granting of credit points including granting credit points to students of other universities,
- Development of didactic criteria for the case study work,
- Selection of appropriate tools based on proper criteria,
- Training of supervisors (STEM professors, e-tutors),
- Suitable evaluation strategies: What should be evaluated and how? (marksmanship of the tools, used methods, effects).

The authors would like to discuss these questions and any other upcoming issue with the participants of the poster presentation.

## REFERENCES

- [1] Zawacki-Richter, O., Bendenlier, S. - Hochschulforum Digitalisierung (2015). Zur Rolle und Bedeutung von Digitalen Medien in Internationalisierungsstrategien Deutscher Hochschulen.
- [2] Kehm, B., Schomburg, H., Teichler, U.(2012). Hochschulforschung – Rückblick auf ein Jahrzehnt. Funktionswandel der Universitäten. Differenzierung, Relevanzsteigerung, Internationalisierung, pp 9-18.
- [3] Gürüz, K. (2008). Higher Education an international Student Mobility in the Global Knowledge economy.
- [4] De Wit, H. (2002). Internationalization of Higher Education in the United States of America and Europe - A Historical, Comparative and Conceptual Analysis.
- [5] Hahn, C. (2004). Die Internationalisierung der deutschen Hochschulen – Kontext, Kernprozesse, Konzepte und Strategien.
- [6] Altbach, P., Knight, J (2007). The Internationalization of Higher Education: Motivations and Realities.
- [7] Kehm, B., Schomburg, H., Teichler, U. (2012). Funktionswandel der Universitäten. Differenzierung, Relevanzsteigerung, Internationalisierung.
- [8] Bergert, A., Sternkopf, C. (2015). Studium generale oder Wissen, das sich lohnt. Ein Werkstattbericht über den Einsatz des E-Portfolios zur Anerkennung außer- und überfachlicher Studienleistungen. HDS.Journal - Perspektiven guter Lehre, pp. 18-25.
- [9] Paetz, N.-V., Ceylan, F., Fiehn, J., Schworm, S., Harteis, C. (2011). Kompetenz in der Hochschuldidaktik. Ergebnisse einer Delphi-Studie über die Zukunft der Hochschullehre.
- [10] European Higher Education Area – EHEA Ministerial Conference (2012). Making the Most of Our Potential: Consolidating the European Higher Education Area. Bucharest Communiqué.
- [11] Schaper, N. (2012). Fachgutachten zur Kompetenzorientierung in Studium und Lehre.
- [12] Lehmann, B., Dieckmann, H. (2011). Lehren und Lernen in parallelen Universen? Zum Verhältnis von Fernlehre und E-Learning. Zeitschrift für E-Learning, Lernkultur und Bildungstechnologie 6/1, pp 33-47.
- [13] Brennen, S., Kreiss, D. (2014). Digitalization and Digitization: <http://culturedigitally.org/2014/09/digitalization-and-digitization/>.
- [14] Münke, M. - Career Center der TU Bergakademie Freiberg (2013). Ergebnisse der Absolventenbefragung 2012.
- [15] Rektor der TU Bergakademie Freiberg (2014). Zahlenspiegel 2014. <https://tu-freiberg.de/intranet/d4/Informationen/zahlenspiegel-2014.pdf>.
- [16] Rektor der TU Bergakademie Freiberg (2014). Zahlen, Daten, Fakten: Statistische Angaben. <http://tu-freiberg.de/universitaet/profil/zahlen-daten>.
- [17] Rektor der TU Bergakademie Freiberg (2014). Internationalization strategy.
- [18] Bergert, A. (2012). Wozu noch ein E-Learning-Projekt. Acamonta, Zeitschrift für Freunde und Förderer der TU Bergakademie Freiberg 19, pp. 129-133.
- [19] Garvin, D.A. (2003). Making the Case Harvard Magazine. 106, pp. 56ff.
- [20] Bergert, A. (2014). Interdisziplinäre Fallstudien im virtuellen Raum, eds: Junges Forum für Medien und Hochschulentwicklung (2014), Trendy, hip & cool - Auf dem Weg zu einer innovativen Hochschule? pp. 34f.
- [21] Helbig, J. (2014). Virtual Teams.
- [22] Breuer, A. C. (2009). Das Portfolio im Unterricht. Theorie und Praxis im Spiegel des Konstruktivismus.
- [23] Willkens, U. (2011). Zwischen Kompetenzreflexion und Profilpräsentation: Integration von E-Portfoliofunktionalität. Wissensgemeinschaften. Digitale Medien - Öffnung und Offenheit in Forschung und Lehre, pp 102-112.