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Project-based education: Business assignment manual

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Abstract

Shaping authentic and contemporary education together with companies from the region. Students will learn new skills in a realistic environment. Project-driven education fits well with shaping realistic and authentic assignments together with companies. The benefits of project-based education with the direct involvement of a company or companies come from the close interaction between school and workfield. Teachers are forced to work close together with a company wich inforces charing of current knowledge needed. Students in return work on actual issues wich are relevant and meaningful. Companies have a say in the offered curriculum and also get an early insight in possible labour potential.

Keywords: Project-based education, authentic and realistic assignments, meaningful education, knowledge sharing.

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1. Introduction

Together with the business community Tech Campus Nieuwegein, a college of ROC Midden Nederland, creates a hybrid learning environment that gives students more choice in educational content. Co-creating education can lead to more current and authentic education. A close collaboration with companies offers teachers the opportunity to evaluate the currency of their knowledge base.

This collaboration with the business community can be achieved in various ways. For example: developing the curriculum together, giving guest lectures and offering internships for students. Starting in 2019, the `Build Environment and Engineering' team of Tech Campus Nieuwegein has been offering in-company assignments for students to carry out. So far these assignments only have been carried out with European qualification framework (EQF) level-4 students in Build Environment and Engineering. With these students it has been proven to be a powerful teaching method. At the time of this writing sustainable agreements have been made with at least sixteen companies. Currently between ten and fifteen company assignments are structurally offered in the level-4 courses Build Environment, Engineering and Civil Engineering. The teachers involved work together with the various companies. Multidisciplinary education that has so far been well received by almost everyone involved.

1.1 Business assignments according to the project-driven education model

The project-driven education model used, appears to fit well with the way of working at various participating companies. The company fulfills the role of customer/client, is a professional expert in specific areas and is often able to transfer broad procedural knowledge since they have to keep up with current laws and regulations. Students learn partly at school and partly at the company. Preference is given to a division of one day at the company and one day at school. This provides an authentic context one day a week and it encourages regular contact with the companies. Experience shows that an assignment from a company without further active involvement is less powerful than when the company takes an active role. Since the teachers at school are responsible for the students' learning process, active communication with the companies is very important. What seems to work well is appointing different core teachers to supervise a group of students. The core teachers must actively maintain contact with the associated companies. Unto the current school year a number of approximately twelve teachers of Tech Campus Nieuwegein have worked together with approximately sixteen companies. However not at the same time. Simultaneously about eight teachers and about four to six companies are involved. As indicated earlier, a supportive attitude towards each other is important.

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2 Project-based education at Tech campus Nieuwegein

Project-driven education fits well with shaping realistic and authentic assignments together with companies. By using a clear teaching methodology throughout the entire course, students learn to shape projects in a structured way. Although there are different approaches to successfully completing a project, the majority of the compagnies the Build Environment and Engineering team collaborate with, are familiar with a six-phase project methodology. The word project can also be seen as an abbreviation for a number of English keywords: Purpose, Result, Organization, Joy, Excellence, Communication, Teamwork. As evidenced by the word Joy , carrying out a project and preferably concluding the project with a good result is something to be happy about (Both & Schroevers, 2007).

ROC Midden Nederland focuses on students who are motivated, experience ownership, feel involved and have control over their own learning process. With a non-linear curriculum, good guidance from teachers, tailored feedback and close collaboration with the business community, ROC Midden Nederland is committed to achieving these goals. Project-based education offers a more holistic approach that trains students across disciplines. It appears to be a good method to give substance to the vision and mission of Tech Campus Nieuwegein. The experience to date is that both students and teachers from the Build Environment and Engineering team of Tech Campus Nieuwegein are energized by project-based education. Feedback from students usually states that the project assignments are appealing and meaningful (Bosch & Koch, 2020).

2.1 Project steps

The Build Environment and Engineering team of Tech Campus Nieuwegein uses the guidelines from Both & Schroevers (2007) to form project-based education. Six consecutive process steps are completed each time. These six steps, also referred to as phases, are successively: Initiation phase, Definition phase, Design phase, Preparation phase, Realization phase and the Aftercare phase.

2.1.1 Initiation phase

In this phase, students form the project groups. Various roles can be distinguished within a project group. In any case, one is required to be appointed project leader. In addition, roles can be designated such as: designer/draftsman, technical executor, maintenance specialist, etc. Depending on the assignment, relevant roles should be assigned within the project group. Every role has different tasks and responsibilities. The role of the project leader is very important, as it directs the creation and compliance of the action plan and the project planning. In addition, the project leader has the duties of chairing meetings and communicating meeting agenda and minutes with the teacher and any contact person within the company. The project leader talks with group members on compliance with the plan.

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In the initiation phase, choices must be made about how the project will be tackled. At the end of the initiation phase, it must be sufficiently clear what the end result will be and what it certainly must not be. The problem definition, working method, feasibility, etc. must be clearly expressed. (Both & Schroevers, 2007, p. 194)

2.1.2 Definition phase

In this phase the client's requirements and wishes are recorded. Any conflicting requirements must be recognized and discussed with the client. A clear distinction between the functional requirements (for example: is the end result suitable for what it is intended for?) and operational requirements (is the end result easy to maintain/control?) is described. Carrying out market research and creating a project plan with clear deadlines are important parts of this phase. At the end of this phase there must be a project program approved by the client. (Both & Schroevers, 2007, p. 197)

2.1.3 Design phase

The main goal of this phase is the realization of the project design. The project design actually answers the question of how the project will lead to the desired result. A cost overview must included in the design proposal. The ideas should be discussed with the client, any additional wishes, if feasible, are added to the design. After this, a new cost figure is created, which must again be discussed with the client. A detailed planning in time for the design phase and a global planning for the remaining phases is an important part of this phase. (Both & Schroevers, 2007, p. 200)

2.1.4 Preparation phase

In the preparation phase, matters from the design phase are developed further. The design phase and preparation phase overlap, so to speak. Activities from the first draft are divided into sub-activities for the designated group members. Ensuring that construction schedules, working drawings, production drawings, production schedules, parts lists, material lists, etc. are up to date is an important part of the preparation phase. (Both & Schroevers, 2007, p. 202)

2.1.5 Realization phase

During the realization phase, everything described in the project plan is actually implemented. The first four phases were mainly focused on thinking about the project and the steps to be followed, the realization phase is mainly focused on doing it. Any product deviations must be discussed with the client. Proposals for improvement are part of this. A satisfied client is an important goal to achieve here. With proper consultation, a mistake does not have to prevent this to stand. (Both & Schroevers, 2007, p. 205)

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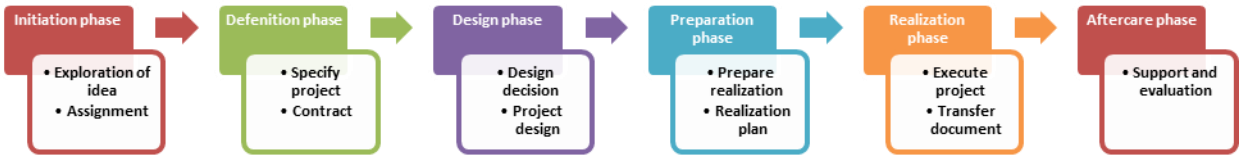
2.1.6 Aftercare phase

This final phase is aimed at evaluating and assessing the project. Student have to check whether all documents are complete and all signatures have been made during the project. An important part of the aftercare phase is a presentation of the project in which feedback is requested. A good project evaluation can lead to a better approach for a new project. Evaluate and reflect on all activities and results achieved during the project therefore are of great importance. (Both & Schroevers, 2007, pp. 207-210)

Figure 1 - Flowchart six phase project aproach



Source: made by author based on models from Both & Schroevers (2007)

3. Student in control

Project-based education requires a high degree of self-direction from students, especially in the higher grades. Self-management is not always easy, but it is a powerful way of learning. Self-made choices in what and how one learns lead to better and more sustainable results. However, self-management can also quickly turn into frustration when students get stuck on a certain part of the project for (too) long. Students often lack sufficient prior knowledge to ask the right questions (Luken, 2008). Student coaches have the sometimes difficult task of signaling in a timely manner that students have gotten stuck and can no longer progress without help. Providing essential information and training necessary skills, is an important part of project-based education. Hattie & Timperly (2007) state that providing effective feedback to the student is also an indispensable part of good education.

3.1 Feedback

According to Hattie & Timperly (2007) there are multiple studies into learning effects that show that feedback given at the right time, leads to high learning outcomes. Not only an occasional tap on the shoulder or a little push in the back, but also substantive feedback is of great importance. Interim feedback is essential for the student's learning process. To ensure that all students receive feedback, a number of fixed feedback moments are scheduled during the teaching periods, usually halfway and at the end of each period (a period is usually ten weeks). Feedback is given based on various matters that may vary slightly per assignment.

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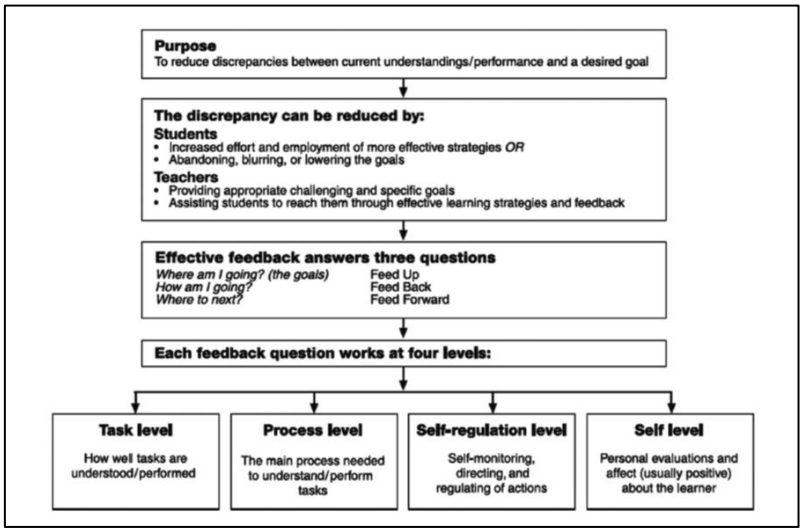
There are a number of desired outcomes from the students that are considered with every project assignment;

- Formulate and reporting
- Plan by Approach and schedule
- Design (technical design using CAD)
- Working posture
- Communication
- Quality assurance
- Presentation

The desired outcomes are the guideline in order to give feedback to the students at the right time when needed. To do this together with untrained representatives from companies requires a lot of attention from the responsible teachers. Developing and learning of giving good feedback is a skill that needs continues attention. Besides the often not knowing what the skills in this matter from de company representatives are, also some teachers might not be as good equipped with these skills. It remains a challenge to give the students the feedback at the right time and right level they need. It requires a lot of synergetic working together of the teachers, company representatives and of course the students. Within the team Build Environment and Engineering interim assessments of project progress as well as the end assessment are always given by two teachers and preferelaby a representative of the involved company. By having these teachers assessing the students together, they also gain mutual insight into each other's views and interpretation of the work done by the students. It is important not to form the same pairs each time, but to rotate in them. This to keep the vision on education as broad as possible within the team.

Figure 2 - the power of feedback flowchart



Source: Hattie & Timperly (2007)

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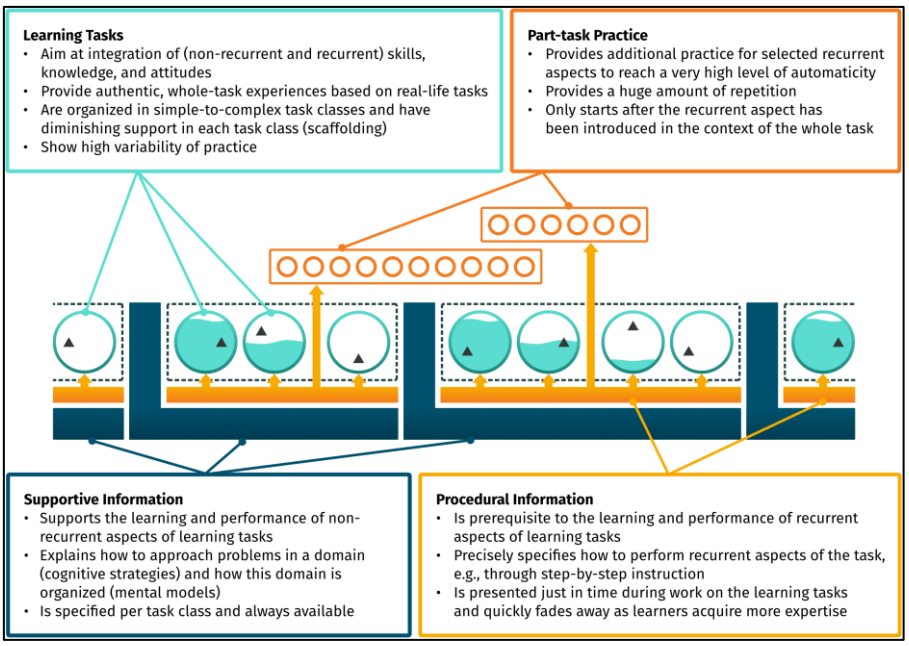
3.2 Instructional design

Many schools in vocational education and training (VET) in the Netherlands use the four components instructional design model (4C/ID model) in parts of the curriculum. The project-based education described in this paper is no different. Van Merriënboer (1997), one of the key developers of the 4C/ID model, states that it is a very suitable educational instruction design for education aimed at complex skills. Complex skills refer to the ability to consciously process related tasks. The 4C/ID model always focuses on an integral authentic learning task. In order to properly perform this learning task, skills training is required, the so-called sub-task exercises. Underlying, and somewhat independently of the concrete learning task, supporting, or procedural, information must be provided to students. More substantive information, which is given exactly when a student needs it, is of great importance during the execution of the learning task (just in time information). What is referred to as a learning task in the 4C/ID model, is referred to as a project assignment in project-based education. During the training, the project assignments should become more complex in nature and less guidance of the students should be provided according to the 4C/ID model.

Members of the team Build Environment and Engineering of Tech Campus Nieuwegein find that the business assignment should always described together with the participating companies. The 4C/ID model is the basis for describing and designing the project assignments. By actively shaping the assignment and components of the assignment together with a company, it contributes to knowledge sharing between the company and the supervising teachers. It helps in maintaining an up to date knowledge base of the teachers.

Figure 3 - Four-Component Instructional Design



Source: (4CID.org, 2024)

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4. Coaching

Personalized education on the Tech Campus Nieuwegein focuses on the development of; control over the learning process, ownership, motivation and involvement of the student. The Tech Campus Nieuwegein does this by focusing on good guidance, providing feedback, offering a non-linear curriculum and collaboration with the business community. Designing personalized education is tailor-made, there is no immediate blueprint that applies to all teams (Bosch & Koch, 2020). The vision of the Tech campus Nieuwegein serves as a guideline for project-based education in which we want to do justice to personalized learning as much as possible. Teacher teams at Tech Campus Nieuwegein are still learning this.

4.1 Teacher rolls

Strengthening direction, ownership, motivation and student involvement largely requires coaching according to Bosch en Koch (2020). In addition to coaching, there are a number of important guidance roles to be fulfilled in project-based education. For example, providing the necessary knowledge base is an important task for supervising teachers. This concerns both broader procedural information and substantive information and practicing the sub-tasks. Supervisors should be aware that students will not easily discover things on their own according to Valcke (2007). Supervisor roles such as pedagogue, didactician, subject expert, leader, instructor, coach, host, presenter, confidant, etc. . . can be equally important at a certain point in the training. It is good to take into account the fact that teachers usually have a different teaching style. Teachers in the team Build Environment and Engineering are no different to this. This is the professional independence that Hattie (2008) believes teachers enjoy. The different teachers, and therefore styles of guidance, can strengthen the guidance given to students. Of course, the different styles can also get in each other's way and negatively influence the students' learning process. It is therefore highly recommended that the supervising teachers regularly discuss with each other and share their individual visions on education. Teachers who inspire, support and advise each other in their own development and that of colleagues, contribute to their own and each other's professional development (Hattie & Timperly, 2007).

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5. Conclusion

The team Build Environment and Engineering shapes the vision and mission of Tech Campus Nieuwegein through project-driven education. There is an important task for the supervising teachers in project-driven education. The project assignments should increase in complexity during the training. The guidance should be reduced, but not in too large steps, as there is a lurking risk that students will get stuck. Providing targeted feedback to students, partly aimed at the student group and partly individually, is essential. It can be a challenge to offer the perfect education for each individual student. Good guidance is very decisive for student success. Guiding students in project-based education largely consists of coaching. However, it does not consist solely of coaching. Students must be taught sufficient knowledge and skills to be able to carry out the assignment properly. Students should not be expected to already have this prior knowledge or to be able to find and learn it independently. Teachers can use their individual teaching styles to strengthen each other. This requires an inspiring, supportive and advisory attitude towards each other. And in order to stay well informed of the latest developments in the business community, the teachers must actively shape the assignments together with the participating companies. Knowledge sharing is an important component of business assignments.

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Conflicts of interest

"The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper".

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