

Paper

Powerful Learning Environments: A Guide to Designing Innovation Labs

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Abstract

The RUAS Honors Program aims to encourage students to develop into excellent professionals. To do so, RUAS has developed a competence profile entitled Learning to Innovate. This profile serves as a guide for designing a teaching approach which enables students to actively develop into such professionals.

There are five crucial characteristics for designing learning environments which challenge students to master the said competence profile: a multidisciplinary issue drawn from actual practice; an authentic learning environment; professional excellence as both the aim and basis for assessment; qualified teachers setting high standards for their students; and working and learning in a Community of Learners made up of all those involved.

In this paper, we first explain the essence of an Innovation Lab or I-lab. We then present some additional considerations and various different approaches to designing a powerful learning environment like the I-Lab.

Keywords: competence profile, innovation lab, learning environment, honors

1. Introduction

Rotterdam University of Applied Sciences (RUAS) applies its competence profile *Learning to Innovate* in its excellence education. Students are encouraged to master this profile during their studies. The university has been experimenting with education in 'Innovation Labs' in order to challenge students for a number of years now. Over this period, we have discovered which ingredients we need to design and implement an Innovation Lab of this type.

Our experience has led us to identify five characteristics and develop them in conjunction with one another, producing what we now call 'effective learning environments'. These

learning environments challenge students - and their teachers - to bring out the best in themselves. The five characteristics are:

- Working on multidisciplinary, practical issues
- Creating an authentic learning environment
- Pursuing and assessing professional excellence
- Having qualified teachers with high expectations of their students
- Working and learning takes place in a work-based learning community in which all those involved (students, teachers, working practice, knowledge centers) have a part to play

The innovative nature of this educational setting forms the basis for learning. The starting point is to identify and work on a practical issue lacking a ready-made solution. It is essential that professional practice also is involved in looking for and assessing solutions.

The role of teacher takes on new features in an Innovation Lab, too. In such a setting, the teacher is not the one who knows everything: on the contrary, he or she intervenes effectively in group processes, stimulates the development of competences and assesses that development. Teachers learn along with their students when developing new knowledge.

We describe the five characteristics in more detail below and provide the necessary evidence base. Section 2 begins by explaining the essence of an I-Lab. What makes it so powerful? Section 3 presents additional considerations that we hope also will prove clarifying to readers. Section 4 describes various different approaches to designing a powerful learning environment like the I-Lab.

2. Essential components for designing an I-Lab

In 2010, we started experimenting with Innovation Labs in our honors program. We have found that the best way to describe an I-Lab is as a 'powerful learning environment' on which we based the design to follow five characteristics (Lappia-van Es, 2015, p. 226; Lappia et al., 2014, p. 22-23):

1. Working on multidisciplinary, practical issues
2. Creating an authentic learning environment
3. Pursuing and assessing professional excellence
4. Having qualified teachers with high expectations of their students
5. Working and learning takes place in a work-based learning community in which all those involved (students, teachers, working practice, knowledge centers) have a part to play.

These five characteristics will only lead to a powerful learning environment if they are all present and interrelated. No one feature can exist without the other.

We start our description of each feature with a quote from the dissertation of Josephine Lappia (Lappia-Van Es, 2015). We then explain the basic concepts and what we mean by them.

Re 1: A multidisciplinary issue drawn from actual practice

'An intractable multidisciplinary issue has been described that students in different disciplines can work on, where relevant in small groups – and, where relevant, with each group consisting of students at different levels of competence. The issue calls for innovation – in other words, it cannot be resolved taking a routine approach – and requires new knowledge and higher-order learning, which in turn means taking a knowledge-driven approach to solving a problem drawn from actual practice (related to knowledge creation).'

What do we mean by 'intractable' and 'multidisciplinary', and why do these concepts represent the essence and therefore the starting point of I-Lab design?

The issue presented to the students must be intractable. What we mean is that the issue must be raw, open, complex, perhaps even hairy or slippery, making a routine approach unsuitable. By raw, open and complex, we mean that we cannot isolate aspects of the issue to make the issue easier for students to 'digest.' In other words, we cannot turn the issue into a theoretical or academic problem that allows students to practice applying a theory.

The issue presented to students should encourage multidisciplinary cooperation. What we mean is that the issue should be of genuine relevance in the world outside the I-Lab; stakeholders in the profession and in society are looking for answers, too. They need – and they have a vested interest in – new insights and new or innovative strategies. The issue should therefore be presented in the same way that it has arisen in the profession and in society: as a complex, complicated matter, with no solutions within easy reach, seemingly unsolvable.

This approach produces an issue that requires contributions from different disciplines. Coming up with satisfactory answers is impossible without exploring the issue from differing perspectives or without applying analysis and operational models drawn from different disciplines, whether academic or professional. It takes a multidisciplinary effort and innovative approaches to find solutions.

Because the issue requires a multidisciplinary, innovative approach, it logically also involves cooperation between teachers, internal and external experts, and students majoring in different subject areas or enrolled in different study programs. Their cooperation is not about the act of cooperating itself. To explore every facet of the issue and come up with solutions or start identifying solutions, students, professionals in the field, and teachers need expertise, analysis models, operational models, skills, and forms of cooperation utilized in various different subject areas and the profession.

Exploring and coordinating the different forms of knowledge present in those disciplines, in the profession, and in research can help in the quest for answers. To arrive at innovative solutions, answers must be assessed and coordinated using different methods, for example 'idea-generating sessions' or 'scrum meetings'.

Idea-generating sessions consist of the following process: diverge, converge and interim consolidation – ‘Where do we stand?’ – and proceed. This process teaches the participants to learn about and utilize one another’s expertise. In a scrum meeting, the back-and-forth process always takes place within the group. The idea-generating process also is suitable for individual students working on their own.

These processes offer a relatively systematic manner of bringing all the different facets to the fore. The point is to scan, explore, search for and discover new options.

Re 2: An authentic learning environment

‘Teachers have worked with partners in the profession and researchers at a knowledge center to create a challenging learning environment for honors students. This environment calls for “situated learning,” in other words learning in a context that resembles the situation in which the students will have to “learn to innovate” – it is related to the ability to function in a demand-driven system (Herrington & Oliver, 2000). An authentic learning environment requires both teachers and the honors program to be externally oriented, in other words to focus on issues and options drawn from professional practice.’

What do we mean by ‘authentic’ and why is this a feature?

The word ‘authentic’ fleshes out the relationship with (1) ‘an issue that must be of genuine relevance in the world outside the I-Lab.’ By presenting students with a genuine issue, I-Lab invites cooperation as it will take place later in the world outside, as they work on a problem in a team with their colleagues and experts from multiple disciplines. Because the outside world genuinely needs answers, students also will feel challenged by and held directly accountable for the situation that they will encounter at a later stage, helping students form a clearer idea of their future profession.

An authentic, challenging learning environment develops by creating the most ‘genuine’ circumstances possible, circumstances that will also arise later when students are working in their profession. By most ‘genuine,’ we mean circumstances applicable to the following:

- urgency: stakeholders are ‘waiting for answers’; it truly matters that students are searching for and finding solutions or attempting to do so because the profession has no answers yet
- commitment: those who have presented these complex issues are actively committed to the learning process
- CoP/CoL: students, teachers, knowledge centers and stakeholders from the profession and society build an alliance because they are actually all learning; working together gives rise to a Community of Practice (CoP), also known as a Community of Learners (CoL)
- shared ownership: the totality of elements listed above gives all the participants a sense of ownership; everyone feels responsible for the outcomes and for working on those outcomes as a team

An authentic, challenging learning environment requires teachers to adopt a different role and to use different interventions than a teacher in a ‘traditional’ classroom setting. We take

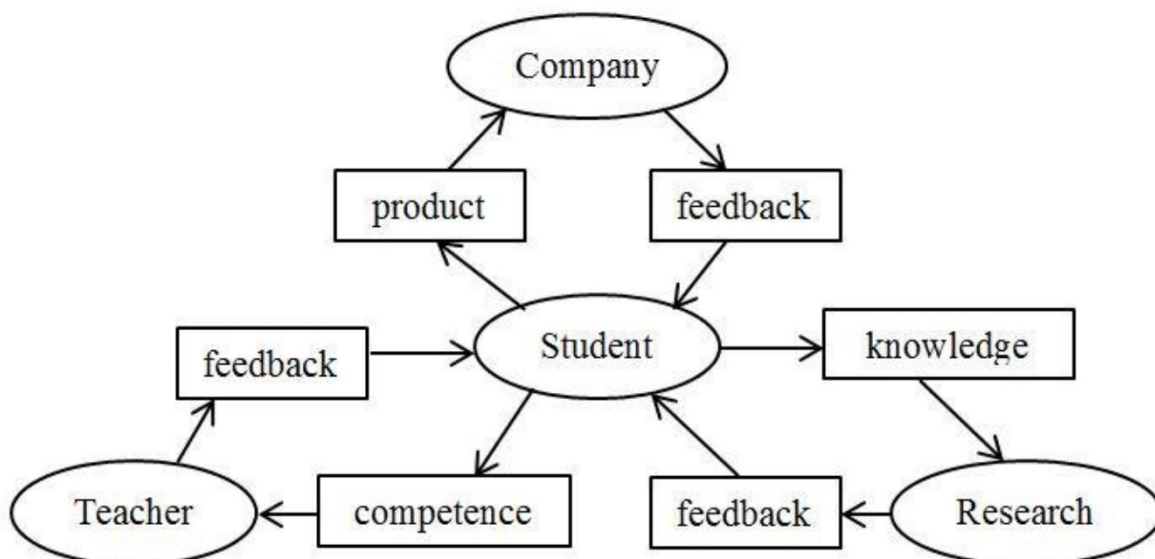
inspiration from the Triple Helix Learning Environment model because our experiments have shown how well it can work in an I-Lab setting (Blom, 2012).

The Triple Helix Learning Environment model looks like a triangle with four participants: client/profession, researcher/knowledge center, teacher, and student. The student occupies the center of the triangle. The three corners of the triangle are occupied by the client working in the profession, the researcher affiliated with a knowledge center, and the teacher. By positioning the participants this way, it becomes clear that each one operates from a different vantage point. Working from these distinct vantage points, each participant bears a different responsibility and - therefore - (should) undertake different interventions:

- The client ('company') is responsible for the value of the product or rather the professional relevance of the outcomes; the client assesses content and utility and whether the outcomes will drive progress in the field. This does not mean that the client/profession awards a mark or score for the outcomes
- The researcher is responsible for the quality, reliability and relevance of the research process that students engage in
- The teacher is responsible for supervising the learning process, or rather for seeing that the student develops the necessary competences, and for assessing that development

Together, with each one operating from his or her own vantage point, the three partners bear complementary responsibility for the quality of the student's learning and of the final product, also referred to as the 'professional product.' The interventions are also complementary, with each partner contributing his or her own expertise. Distinguishing between interventions in this manner gives students space to manage their own learning process. That is their challenge.

Figure 1. Triple Helix Learning Environment model



Source: Blom (2012)

We will return to the teacher's role when we discuss feature four, 'Teachers set high standards for their students,' and in Section 3.

Re 3: Professional excellence as both the aim and basis for assessment

'Our aim and the basis for our assessment is for students to learn to innovate by working to develop innovative solutions to problems drawn from actual practice. As a general Honors Program attainment aim, professional excellence is elaborated in the Learning to Innovate competence profile. The profile consists of five distinct but indivisible competences: being innovation-driven, being demand-driven, being cooperation-driven, being able to engage in interactive learning, and being able to generate new knowledge.'

The relationship between a powerful learning environment and the eliciting of professional excellence.

The questions that naturally arise when working on multidisciplinary issues drawn from current practice and when creating an authentic learning environment are: Where is this taking the students? What are we actually trying to achieve? These questions bring us to the third feature, i.e. the quest to achieve professional excellence (Van Eijl et al., 2013).

As noted earlier, the RUAS Honors Program uses the five competences of the Learning to Innovate competence profile to focus the development of professional excellence. By working in an I-Lab setting, students get to work mastering the five interrelated competences of the profile and in doing so initiate and maintain their professional development. It is possible for them to do this because the five competences are reinterpreted in terms of 'role,' 'domain,' 'specification,' and then in sentences that have the following structure: 'at ..., the aim is to ... so that ...'

Because students initiate learning by tackling a complex multidisciplinary issue, everything revolves explicitly around their learning process and their development. Students will 'automatically' come up with such questions as:

- What will I do or what should I do?
- What will I/we investigate? What knowledge and skills do I need/are needed in this context?
- What will I learn by helping to solve this problem?
- What can I learn with and from others if I want to arrive at reliable results within a given timeframe?
- What am I learning from this about delivering reliable results, about the learning and working process that I am undertaking on my own and with others? What am I learning about my own actions? In other words, students will address the following questions: Am I doing things the right way, am I doing the right things, and am I doing things for the right reasons?

Or, as students themselves have said: 'Working in this setting has helped me discover what I'm interested in'; 'I've learned a lot by cooperating with students from other study programs'; 'I've gotten to know myself better'; 'I have a much better idea of how I see the future'; 'I now know how I can apply the knowledge and experience that I've gained.'

RUAS now offers study and career coaching to help students develop a professional identity. Because such coaching focuses on students' personal and professional development, it is also suitable in an I-Lab setting. Asking students how they relate to their future profession and to their environment kindles awareness. Once their awareness has been raised, students can make sense of what is being asked of them by putting it in their own words. Students can frame their own experiences and then manage their own learning and learning process; they assume control of their learning process.

This is what Biesta (2015) is referring to when he uses the terms 'qualification,' 'socialization' and 'subjectification'.

Re 4: Qualified teachers setting high standards for their students

'The learning environment described above and the issues drawn from actual practice are highly suitable for students who have the desire and ability to develop beyond what a regular Bachelor's program offers them. Honors students want challenges in the form of complex tasks and high standards, along with more autonomy and space for their own initiatives. Students and teachers have a "growth" mindset (instead of fixed mindset) (Dweck, 2010), with teachers viewing a practice-based honors program as a means to encourage students to develop above-average ability, creativity and task commitment.

Motivation is the main recruitment and selection criterion for honors students. Teachers seek teaching strategies that will induce problem ownership and commitment among honors students.'

What do we mean by setting high standards and why are they necessary for development?

It is not possible for students to work on multidisciplinary issues in an authentic learning environment with the aim of attaining professional excellence without teachers setting high standards for them. As we all know, telling people often enough that they are incompetent and not encouraging them to work on mastering a skill will undermine their confidence in themselves.

Setting high standards and exuding confidence in students' ability to meet those standards are therefore essential components of a powerful learning environment. They cannot be viewed separately from creating challenging learning environments in which students are truly able to show that they deserve the confidence placed in them. That is how students can gain 'self-efficacy.' Setting high standards also cannot be viewed separately from encouraging students to take charge of their own learning processes.

The essence of all this lies in combining the two vantage points mentioned: 'You are willing and able, or you will want to be able.'

The first criterion for inducing this process is for teachers to deploy reflection in their coaching. The second criterion is to turn compiling a portfolio into a meaningful

development exercise. The third criterion is for teachers to be aware of their role in the Triple Helix Learning Environment – and to act accordingly.

Teachers who design and work in powerful learning environments must have or develop the ‘open mindset’ described by Dweck (2010). An open mindset starts by identifying and learning to recognize one’s own prejudices. This makes it possible to discern differences between students and to learn how to deal with them. Important questions in that context are ‘What should I, as the teacher, do to teach this student how to take charge of his or her own learning?’ ‘What pedagogical skills must I, as a teacher, master so that I can apply them flexibly to support students’ learning processes and development?’ What is remarkable is that an open mindset leads, almost automatically, to inclusive education.

Students who choose to enroll in honors programs tend to have the following personality traits (albeit in latent form): above average ability, creativity, and task commitment. By enrolling in an honors program, students call on these traits and make them manifest. As Renzulli (2012) and Scager et al. (2012) have shown, one factor is that these three traits need to be present in relatively equal measure. It is up to teachers to have the knowledge and skill to recognize these traits in students. What challenges will a student then face and what type of supervision or coaching will he or she need to meet those challenges?

Re 5: Working and learning in a Community of Learners made up of all those involved

‘Because the supervision method places considerable emphasis on student autonomy and self-guided learning, it is very important for students and teachers to build a relationship (of trust) and become a close-knit community; this proposition is supported by the theory of the authentic learning environment and situated learning (Herrington & Oliver, 2000) and by Deci and Ryan’s Self Determination Theory (SDT) (2002). Communities of Learners are an important part of an authentic learning environment and act as a gateway to the various “Communities of Practice” (Wenger, 2009; Lave, 1991) that students will enter after graduation as subject specialists and as resilient and innovative professionals.’

What do we mean by Communities of Learners and what are their crucial elements?

The fifth feature, an I-Lab Community of Learners, brings us full circle: if learning commences when students tackle an intractable issue drawn from current practice in an authentic learning environment with the aim of developing professional excellence and in which they must meet high standards, then a ‘temporary’ community will arise in which students, teachers, researchers and professionals learn and work together. We refer here to the term ‘experiential learning’ and the associated learning cycle (Hargreaves & Fullan, 2012; Kreber, 2001).

All those involved band together in a Community of Learners (CoL), sometimes known as a Community of Practice (CoP). Elements crucial to creating a CoL that functions as it should (Andringa, 2014. Lave, 1991, Wenger, 2009) are the following:

- a common cause; an urgency felt by all participants, a problem drawn from current practice that all view as intractable, and the need and desire to solve it

- the realization that no routine answers are possible; the problem genuinely requires innovation, not improvement
- the participants themselves help determine the way forward

Before a CoL commences, the participants should consider the following steps:

- Make clear what the community is about, that you as Learners will be embarking on a journey together, that the itinerary is not fixed and neither is the destination, that you will be involved in a process of seeking and learning that can easily go off in any direction if there are no guideposts, and that guideposts can serve to mark out the domain. Issues are worth the effort if they have the potential to spur people into action
- The more urgent the issue, the better
- When assembling a group of students, teachers, researchers/research coordinators and professionals, make sure that the various participants possess or can call on the expert input needed to find answers
- Consider knock-on effects, in other words: one group finishes but the problem cannot yet be solved, so the next group continues working on it
- Support development, be aware of the distinction between overseeing the subject matter and overseeing the working and learning process; carve out space to let go of patterns of thinking, to generate trust, to ask questions
- The group is responsible; the focus is on the group's target and, following on from this, on the individual and group learning processes
- Reflect: Are we still doing the right things? Are we still working to achieve our target? Take time to create a learning history document
- Do new things; a CoL focuses on learning to innovate. Learning and innovation are cyclical processes that occur simultaneously in individuals, in groups, and within and between organizations
- Make the time and effort to list the results and publicize them

3. Considerations and additional information

Readers will have noticed various recurring concepts in this text. In this section, we attempt to explain some of these concepts or topics in more detail. The considerations and additional information are meant to help teachers design powerful learning environments.

Our experience has shown us that combining the five characteristics with the Learning to Innovate competence profile can indeed produce powerful learning environments.

Thoughts on 'innovating'

The word 'innovating' evokes many different images. What do we actually want from students when we ask them to innovate? Are we expecting them to come up with an entirely new answer that no one has thought of before? Do we want new forms of knowledge? Are we asking for a new approach, in other words a new working process leading to innovation? Do we want their personal and/or professional development? Or are we asking for all of these combined? We believe it is the latter, and research and the literature appear to support our view.

For her PhD, Suzanne Verdonschot (2009) studied what produces breakthroughs in innovation practices. She approached the subject from the perspective of the ‘profession,’ not that of education. In her study, she identifies eleven ‘design principles’ on which innovation is conditional:

- Formulate an urgent and intriguing question
- Create a new approach
- Work from individual motivation
- Make unusual combinations of subject matter expertise
- Work from mutual attractiveness
- Build on strength
- Create something together
- Entice [students] to see new signals and to give them new meaning
- Connect the world inside the innovation practice to the world outside
- Pay attention to the social and communicative process
- Actively support the development of competences

What is noticeable about these design principles is that, when we approach innovation from the perspective of ‘the profession,’ then the issue itself turns out to be essential; it provides inspiration, it motivates, it acts as a driver.

Besides connecting the world inside and the world outside innovation practice, another striking design principle is to make use of unusual combinations of subject matter expertise.

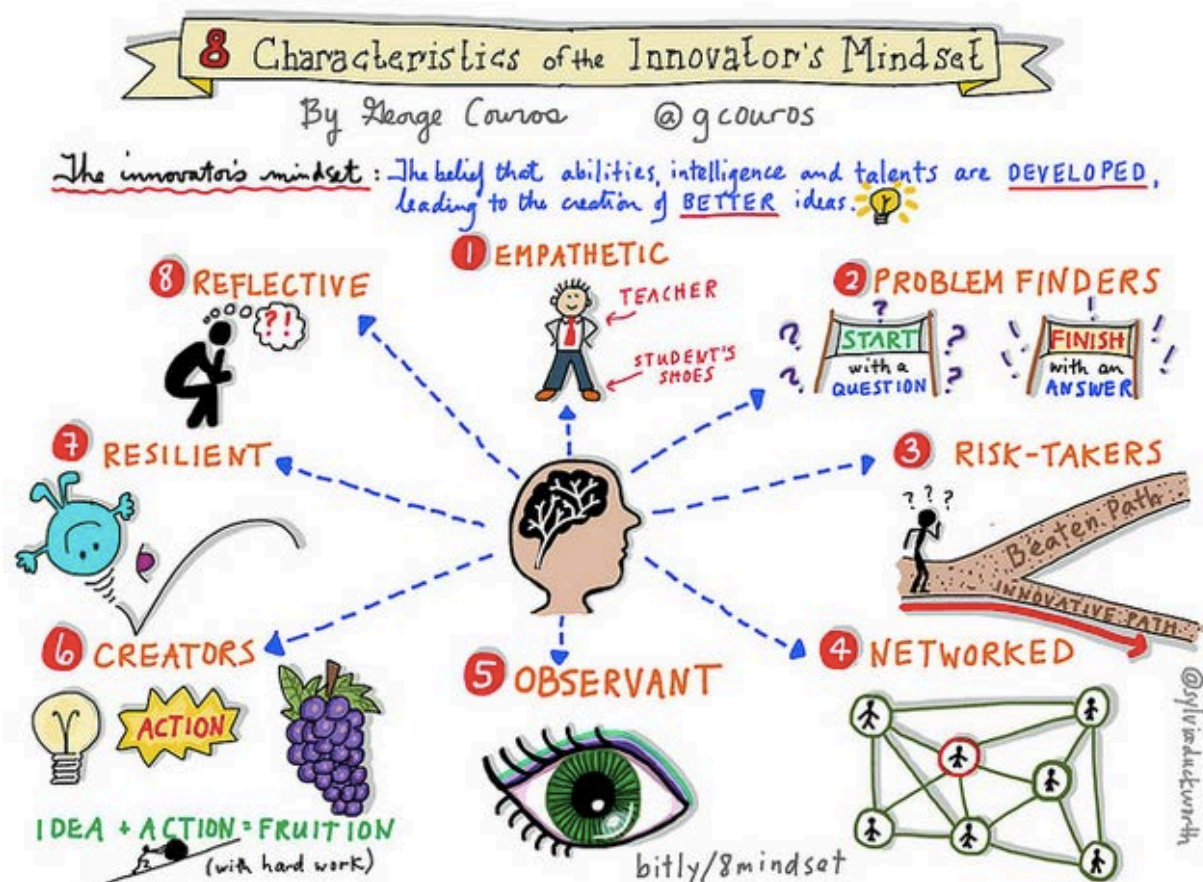
The foregoing principles reappear in some of the five characteristics for designing powerful learning environments, although different wording is used: formulate an urgent and intriguing question; make use of (provide) unusual combinations of subject matter expertise; connect the world inside... with the world outside.

The foregoing in fact also applies to George Couros’ ‘Innovator’s Mindset’ (2014), which we elaborate on below (see figure 2). Couros identifies eight characteristics of the Innovator’s Mindset:

- Empathetic putting ourselves in another’s shoes
- Problem Finder asking good questions instead of simply asking for answers
- Risk Taker going off the beaten path – trial and error
- Networked being connected – sharing ideas leads to better solutions
- Observant looking around – recognizing and creating connections
- Creator turning ideas into action
- Resilient persevering when things don’t work on the first try
- Reflective looking back and looking ahead

Interestingly, these eight characteristics run parallel with concepts used in RUAS’s description of the ‘Learning to Innovate’ competence profile.

Figure 2. Eight characteristics of the Innovator's mindset



Source: <http://georgecouros.ca/blog/archives/4783>

Peter Oeij (2017) received his doctorate for his research on 'Resilient Innovation Teams.' The main question that he addresses is: What typifies project teams that exhibit innovative behavior? In his study, he focuses on team behavior. What repertoire of actions is needed during critical incidents; in other words when a routine approach is not enough? How can teams improve the success of their innovations?

Oeij - too - arrives at a number of traits that he refers to as 'innovation resilience behavior':

- to be alert of 'weak signals'
- to resist oversimplification by suggesting valid alternatives
- to remain sensitive to what is done in the projects, why and for whom
- to be able to change course when needed
- to defer to expertise
- to monitor vigilantly what the team does
- to brief and debrief decision making during the project
- to reflect and organize feedback loops in order to learn from what the team does

These traits are backed up by organizational conditions for innovation resilience behavior: team psychological safety, to allow team members to make mistakes; team learning, i.e. a team climate that encourages experimentation; team voice, i.e. all team members have a say in decision-making; and complexity leadership, i.e. leaders who can reconcile possibly opposing views.

Finally, Oeij developed various instruments to analyze 'innovative behavior' and track down obstacles.

Here – too - we recognize a number of concepts that also play an important role in learning to innovate: '...consider valid alternatives; allow mistakes; leave room for experimentation; defer to expertise.'

Thoughts on reflection and the role of the portfolio

Reflection is not always very popular in higher professional education. Too often, students are asked to reflect during the course of a year without having gained enough practical and learning experience to reflect on. If reflection is then not followed up by meaningful and instructive discussion, students are likely to resist. In short, one could say that we are ourselves to blame for such fierce student resistance.

And yet, we know that reflecting on experiences, and especially on experiences in profession-critical situations, can help students engage in explicit learning and encourage them to manage their own learning process. By engaging a student in a dialogue about his or her profession-critical experiences, we can trace learning moments that may have initially escaped the student's notice. Asking questions – sometimes specific questions – plays an important role in this.

By reflecting, both one-on-one and in a group, students learn to ask themselves such questions as:

- Have I/have we done the right things?
- Have I/have we done things the right way?
- Have I/have we done things for the right reasons, considered the right factors with regard to ethical aspects, accountability to society, financial prerequisites, ...?

Reflection should include these three aspects.

We can take reflection full circle by asking students what reviewing the foregoing three aspects has taught them about their own development and how much progress they think they have made:

- What have you learned about yourself?
- What have you discovered about your strengths and weaknesses?
- What have you learned about your efforts?
- What have you learned about your role in the team, your contribution to the process itself, and about developing your expertise?
- What will you do with that information?

Taking reflection full circle makes it meaningful and effective for students.

Reflecting on practical and learning experiences helps students develop their own ideas about what their future profession will require of them. Nowadays, we refer to this as 'professional identity' (HR, 2016a). By encouraging professional identity in students, we are addressing such questions as 'Who are they as people?' 'What do they want to learn?' and 'How do they wish to relate to their profession and environment?' Students need to engage in the process of reflection so as to make conscious choices in learning, to take charge of

their own learning process, and to make the transition from ‘study coaching’ to ‘career coaching.’

Keeping a logbook and compiling a portfolio are activities that support reflection and the students’ transition to career coaching. They help students become aware of what they are working towards and what they must learn and master to get there and support them in developing their own initiatives. In this context, the portfolio becomes a development instrument in which students collect experiences, reflect systematically (for example using the STARR model) and are given feedback in dialogue with fellow students, supervising teachers and external parties.

Students will only be prepared to pour energy into assembling a portfolio if that dialogue turns out to be useful for their own development. The best and most effective form of ‘development portfolio’ will need to be identified for each ‘professional practice.’ In the Honors Program, the portfolio can easily be used at the end of the course for purposes of final assessment.

Thoughts about the need for teacher expertise in an I-Lab setting

‘The teacher makes the difference.’ We can tinker around with all sorts of factors, but research has once again shown that the teacher’s pedagogical expertise is and remains the decisive factor in student learning.

Designing an I-Lab requires teachers to have expertise in relation to at least three features:

- determining the suitability of issues
- supervising and intervening in group processes and maintaining high standards
- supervising, coaching and assessing student competence development

Teachers need not all be experts in ‘everything.’ Those assembling teaching teams can also ensure that the team as a whole possesses different forms of expertise. That way teachers can complement and even learn from one another.

Teachers must be capable of determining the suitability of a particular issue, in any case with respect to the characteristics ‘multidisciplinary,’ ‘professional excellence’ and ‘Community of Learners.’

For teachers to determine an issue’s suitability requires them to discuss the role that the external partner or client plays in an I-Lab. The involvement of external partners plays an important role in the exploration of an issue and the space that students need to do so. Experience shows that external partners and experts are prepared to play a role in I-Lab settings.

Teachers must also be capable of designing and supervising learning/working processes, for example ‘idea-generating sessions’ – processes in which students master the art of diverging and converging. Becoming skilled at this type of method encourages students to be active, to explore, to feel confident, to take risks and to take responsibility.

Teachers need to be or become skilled at knowing ‘when and when not to intervene in group incidents,’ ‘when and when not to intervene in a group process,’ ‘when and when not to step

back,' 'when to take the time to analyze a group process with students from different vantage points.'

When teachers intervene, they should always ask themselves 'What is this teaching us about our approach, our team, and ourselves? What do we need to go forward, in terms of subject matter, processes and as individuals?' By engaging in this manner, teachers build their own expertise.

When it comes to encouraging student competence development, the skills toolbox should also include supervisory skills. What sorts of questions and which interventions encourage students to learn? How can teacher and student have a dialogue about entries in a portfolio? How do you foster 'explicit' learning in students? The teacher's role as 'competence supervisor' requires these skills. Another necessary skill is the ability to give feedback at differing levels of reflection (Korthagen & Vasalos, 2005).

In terms of subject matter, teachers should exercise restraint in two different ways. On the one hand, no one can be an expert at everything; on the other, students need to take the initiative in calling on teachers' and external partners' expertise. What is important, however, is for teachers to recognize when students get stuck and to intervene when they suspect that students are 'oversimplifying.' The SOLO taxonomy may be useful in this regard; it focuses on the concept of 'complexity' and offers a convenient way of thinking about it.

Thoughts on 'testing'

Students generally participate in I-Labs in their seventh semester, i.e. the first six months of their fourth year of study. In theory, they can enroll in an I-Lab at an earlier point in their study program – when these are referred to as 'Try-Labs' – and in any year. The question is how to proceed with testing in a way that assesses individual student achievement.

In higher professional education, students work on a graduation project in which they are required to address the aspects 'context,' 'task,' 'independence' and 'innovation.' The level of complexity of these four aspects and the extent to which students show themselves capable of developing, taking and maintaining control over them gives us a yardstick for determining and assessing the 'quality' of this final project. In terms of 'innovation,' RUAS assesses the 'professional product' that the student produces as either an 'improvement,' a 'change,' a 'renewal' or a 'discovery.' To obtain a Bachelor's degree, students must deliver a product that is at least an 'improvement.' In the Honors Program, they must, at the very least, produce a 'renewal' and preferably a 'discovery.'

We test and assess students using the Learning to Innovate competence profile. We also make use of the Higher Professional Education Graduation protocol and apply various taxonomies to ensure that our testing is satisfactory, valid and reliable. What we aim to assess is how students work in teams on complex issues (drawn from practice). That means that we are obliged to assess four aspects:

- the quality of the outcomes of the student's work; once again, we refer here to the Triple Helix Environment Model: external partners and researchers play a key role in this

- the student's contribution to the working process and group process; supervising teachers and fellow students play a role in this
- the student's individual contribution to the outcomes; supervising teachers and fellow students play a role in this
- the student's individual development: is the student demonstrating an ability to reflect on his/her own actions
 - in relation to the subject matter?
 - in relation to the working and group process?
 - in terms of his/her own and others' actions in that process?
 - in relation to his/her own growth and ambitions?

We base our assessment on the behavioral elements of the Learning to Innovate competence profile (HR, 2016b).

As we noted earlier, we use the Learning to Innovate competence profile as a basis for designing honors education. The five competences featured in the profile have been broken down into behavioral elements. These elements offer guidelines for giving students effective feedback and feedforward. On that basis, students can then set learning and development goals for themselves. We also use level indicators that show, for each competence, the impact that the student's behavior has had on every aspect of the learning process.

This assessment method can be keyed to the student's current year of study. Step by step, and specifically by means of planned dialogues, students can be guided to 'taking charge' of their own learning process. Be aware, however, that each student progresses at his or her own pace.

Where necessary, feedback can be converted into a grade or assessment.

4. Approaches to designing powerful learning environments

We can commence the design process leading to a powerful learning environment such as the I-Lab from a variety of different starting points. We have identified three:

1. Start the design process by addressing a topical issue that has been presented by one or more external partners
2. Start the design process by addressing an issue that you, the designers, have identified. It should be a topical issue in society and/or business but does not come directly from an external partner
3. Combine the above two

The next step is to list the concerns that play an important role in the design process. These concerns should reflect the five characteristics.

Re 1: Designing based on an issue presented by external partners (be over-prepared)

- Explore this issue by immersing yourself in it and by assessing the potential that it offers your students for learning: does it evoke a multidisciplinary setting, is it challenging, complex, intractable? Consider which study programs could play a role
- Discuss the present state of the issue with your external partner or partners – what are the precise questions that need addressing, what innovations are currently under

way in this area, what experiments are already taking place, what opportunities are there – so that you are fully prepared as a teacher and can ask your students challenging questions that will get them and keep them working

- Discuss your external partner's/partners' expectations with regard to his/ her/their role or tasks, as well as their expectations of the other I-Lab participants
- Prepare the authentic learning environment by searching more widely for experts, for example among research coordinators and expertise centers. It is not your job to ensure that the external partners will in fact participate; that is the job of the participating students. However, it does help teachers to know what types of experts will need to be consulted
- Prepare yourself as a teacher by considering what 'professional excellence' means in this setting. Consider which versions of professional excellence might emerge. This step is not meant to be exhaustive but to expand the way you think about opportunities and potential: What can you expect and how will you deal with it? At the same time, you should recognize how this corresponds to setting high standards and the necessary development of/ evolution towards an 'open mindset'
- Imagine all the many things that could happen working in a CoL. Doing so will allow you to explore in advance which interventions might be necessary and to deliberately address the question of when and when not to intervene, so that you can concentrate on getting the students to take charge
- Prepare tests that allow for potential differences that may arise between students. Make sure that those differences are acknowledged and discussed and see that testing and assessment take account of these differences

Re 2: Designing based on an issue that you, the designers, have identified

There are topical issues in society and/or business that have yet to be addressed. They must be tackled because they are expected to require new answers and new solutions; examples include issues related to energy, the environment, social inclusion or the growing level of income inequality.

Producing a design based on an open issue of this kind requires you to start off differently:

- Begin by exploring the issue from every angle as designers so that you know what it entails and which external parties and experts in society and/ or the business sector will be affected by it. For whom is this an urgent issue?
- If your exploration reveals that it is indeed a multidisciplinary, complex and intractable issue that external partners can commit to, then follow the design process described above

Re 3: Designing based on a combination of the two

It is also possible that an external partner will come to you with a question that is very open-ended. For example, in one partnership, a hospital has presented us with the same question for several years in succession: 'We're an innovative hospital. What can or must we do to remain innovative?'

We submitted this question to our students and challenged them to come up with ideas and designs and to find external partners themselves. In this case, teachers should focus on coaching students and encouraging them to seek out 'just-in-time' knowledge.

Whichever perspective applies, the fact is that the preparation process is crucial to powerful and effective implementation!

5. Conclusion

The RUAS Honors Program aims to encourage students to develop into excellent professionals. To do so, RUAS has developed a competence profile entitled Learning to Innovate. This profile serves as a guide for designing a teaching approach which enables students to actively develop into such professionals.

There are five crucial characteristics for designing learning environments which challenge students to master the said competence profile, as demonstrated by experiments which led to PhD research of Josephine Lappia (Lappia-Van Es, 2015).

We have led you, the reader, past these five characteristics by means of a guide. We stopped to consider various perspectives and key issues along the way, all of which will help you as an education designer as you reflect on and design a teaching approach such as an Innovation Lab.

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