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ENABLING LEARNING BY STUDENTS WHEN FACING RADICALLY NEW INFORMATION IN BUSINESS AND MANAGEMENT STUDIES

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Abstract

The aim of this paper is to substantiate the process of enabling learning by students when facing radically new information in business and management studies. Starting from the introduction and the research methodology, the paper follows by referring to Piaget's theory, which presents the accommodation process by explaining the formation of new thinking structures necessary for learning radical new information. The *Seven steps educational process* (SESEP) is then presented by using secondary analysis. The principles of the SESEP model were described by the authors in their previous study while researching the development of education students' competence in using potential learning environments. Secondary analysis allows for a concentrated discussion, revealing how the SESEP enables students (who are studying for a master's degree in education) to learn when they are facing radically new information. The results of interviews with experts (experienced teachers in business and management studies) are presented, which show the possibility to transfer the SESEP into a model for enabling learning by students when facing radically new information (ENARNI) in business and management studies. The discussion of the results leads to a more detailed justification of the model.

KEY WORDS: radical innovation, radically new information, management and business studies, accommodation, learning.

Anotacija

Šio straipsnio tikslas – pagrįsti studentų mokymosi, kai reikia suvokti radikaliai naują informaciją, įgalinimą verslo ir vadybos studijose. Pradedant įvadu ir tyrimo metodologija šiame straipsnyje remiamasi J. Piaget teorija, kuri pristato akomodacijos procesą, paaiškindama naujų mąstymo struktūrų, kurios būtinos siekiant suvokti radikaliai naują informaciją, formavimąsi. Toliau, taikant antrinę analizę, pristatomas Septynių žingsnių edukacinis procesas (SESEP). Autorės SESEP modelio principus pristatė savo ankstesniame tyrime, tirdamos edukologijos studentų potencialių mokymosi aplinkų išnaudojimo kompetencijos ugdymą. Antrinė analizė leidžia vykdyti koncentruotą diskusiją,

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atskleidžiant, kaip SESEP įgalina studentus, siekiančius edukologijos magistro laipsnio, mokytis, jiems susidūrus su visiškai nauja informacija. Pateikti ekspertinio interviu (ekspertai – patyrę verslo ir vadybos studijų dėstytojai) rezultatai atskleidžia galimybę pritaikyti SESEP, siūlant verslo ir vadybos studijų studentų mokymosi, jiems susidūrus su radikaliai nauja informacija, įgalinimo modelį (ENARNI). Rezultatų diskusija kreipia į išsamesnį ENARNI pagrindimą.
PAGRINDINIAI ŽODŽIAI: radikali inovacija, radikaliai nauja informacija, verslo ir vadybos studijos, akomodacija, mokymasis.
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Introduction

The knowledge economy requires people to apply lifelong and life-wide principles; however, resistance to change, especially to radical innovation, has been and continues to be in the focus of researchers. Oreg (2003) identifies six personal reasons that cause people to resist change. 1) *Reluctance to lose control* often accompanies changes that are imposed on someone's life and are not initiated willingly. 2) *Cognitive rigidity* can be understood as the primary dogmatic individual trait that leads to narrow thinking and a reduced ability for change in response to new external conditions. 3) *Lack of psychological resilience* is the absence of psychological resilience, an individual personality trait that allows individuals to welcome change as an opportunity to give up previous models of behaviour and learn new ones. People with low psychological resilience treat change as dangerous, and resist attempts to adopt correct habitual routines. 4) *Intolerance to the adjustment period involved in change* concerns the fact that changes require additional time for learning; some people are stressed by the idea that they will need to do the same amount of work in a more restricted time period. 5) *Preference for low levels of stimulation and novelty* is a personal trait of individuals who prefer to perform within well-defined and familiar frameworks. 6) *Reluctance to give up old habits* is an individual trait that stimulates the repetition of well-known strategies for the sake of comfort, and makes learning new skills and competences in a limited time an unpleasant experience to be avoided.

Other researchers have emphasised that learning demands a transformation of oneself, and the consequences of this transformation can be highly uncertain (Forsell, Åström, 2012; Deneen, Boud, 2014; Patel, 2016). Thus, people may choose to keep things as they are, maintaining their existing identity and the status quo.

Brown (2012) coined the new concept of 'information anorexia', and explained it as 'the idea that one may not be receiving the essential information one needs to be an effective information professional' (Brown, 2015, 154). The reasons for this can include a chronic lack of time, information overload, fatigue, or the feeling of being overwhelmed by the topics or the negativity of information, leading to a position of ignorance relative to the possibility of learning something new.

In the attempt to manage resistance to change in education, some researchers (Tharayil et al., 2018) have suggested the implementation of active learning principles which adopt Vygotskian constructivist theory (Vygotsky, 1978) and 'scaffolding' principles. This would allow the learner to be the main meaning-construing person, to understand why and how something is learned, and to be guided through practical activities with the assistance of the teacher, developing a more independent individual at the end of the educational process.

All of these ideas lead to the understanding that there are numerous reasons why people resist new information, especially *radically* new information (RNI), which is directly related to radical innovation as a new, stand-alone framework corresponding to the idea of doing something that one did not do before (Norman, Verganti, 2014). This understanding also calls for a discussion of ways which would help to overcome personal negative stances against RNI, and to use RNI for learning successfully.

However, none of these resources include Jean Piaget's understanding (1972) that the resistance to learning from RNI could be caused by the absence of mental thinking structures (schemata), requiring the learner to rebuild the existing mental order to accommodate newly emerged information.

Future professionals, especially in the field of business and management, should be empowered to understand, from the above perspective, the reasons why people resist radical new information, and how this type of resistance can be managed. This would help them learn from radically new information, and also to support others in dealing with RNI.

In one of their studies (Kubova-Semaka, Jucevičienė, 2021), the authors of the current paper analysed a case study in researching the development of education students' competence in using potential learning environments as part of the *Seven steps educational process* (SESEP). Unexpectedly, a successful process of accommodation (the formation of students' new thinking structures) was observed. This induces the development of the SESEP by raising the following research question: Can the ideas of the SESEP be applied in the process of the education of students in business and management studies to learn from radically new information?

The aim of this paper is to substantiate the process of enabling learning by students facing RNI in business and management studies.

The paper is structured as follows: first, the research methodology is presented. In the next chapter, the accommodation process, which allows the formation of new thinking structures necessary for learning radically new information, is presented and compared with the assimilation process. In the following chapter, the SESEP is presented by revealing the process of accommodation; i.e. the formation of new thinking structures. The results of expert interviews are then presented, in which

the possibility of transferring the SESEP into the ENARNI model in business and management studies is explored. In the last chapter, the discussion of the results leads to the substantiation of the ENARNI. Finally, the conclusions are presented.

1. Methodology

The main concepts of this research are built within the framework of the constructivist theory of Jean Piaget (1972), and Papert's concept of constructionism (Papert, Harel, 1991).

This theoretical framework allowed the peculiarities of accommodation in the case study of the SESEP via the use of secondary analysis to be revealed. Secondary data analysis, as described by Johnston (2013), was used because primary research of the SESEP has been provided aiming to reveal the principles of the process of the development of the competences to use potential learning environments by students in education (Kubova-Semaka, Jucevičienė, 2021), which unexpectedly also resulted in revealing the challenges of the accommodation from the perspective of RNI that students were faced with. The secondary data analysis allowed for the peculiarities of accommodation and its challenges in the SESEP to be revealed more precisely with the perspective of broader generalisation.

To find similarities and differences between teaching/learning processes in the fields of education and business management from the perspective of the accommodation, expert interviews with experienced business and management teachers were conducted. The expert interview method was used by combining theory-generating and problem-centered expert interviews (Döringer, 2021). Therefore, it was possible to realise not only the analytical but also the interpretative perspective of the information gathered from the interviewees.

All of the interview questions were open-ended. The first part of the interview was problem-centered, and aimed to establish how teachers manage the perturbation reaction of students when they face RNI during their courses (each of the experts chose to analyse a particular course of theirs that related to RNI). The second part of the interview was targeted at theory generating, and involved asking the experts a set of questions. Experts were asked to evaluate the SESEP as an optional tool for accommodation management in the courses that they taught. The experts chosen were highly qualified researchers and experienced university teachers in the business and management field: two full and three associate professors, with international experience in research and teaching, as well as a great deal of teaching experience (from seven to 30 years) at Lithuanian universities. When keeping track of the theory-generating interview, the interviewer acted as a co-expert. This was possible because one of the co-authors of this paper is a

highly qualified researcher in education and human resource management (whose qualification is acknowledged by her university) and has successfully taught at a university for 40 years. All of the interviews lasted for approximately 45 minutes, were conducted via the Zoom programme, and were recorded for further analysis with the permission of the interviewees.

The last step in this research included the final substantiation of the ENARNI model for use in business and management studies. The SESEP was used as a background for the ENARNI. The SESEP was discussed by using the results gathered from the expert interviews, and the discussion was supported with the sources gathered via the integrative literature review method. An integrative literature review was chosen because it is applicable when research aims to establish new theoretical frameworks (Snyder, 2019).

Research ethics were maintained in the course of this research. The general principles of research ethics, respect for people, beneficence and justice (according to the Declaration of Helsinki), underpinned all research activities, and special attention was paid to attaining informed consent (Rhodes, 2010) while conducting the expert interviews.

2. Accommodation and assimilation as described by Jean Piaget's theory and further developments

Jean Piaget (1952, 1972) was the progenitor of the constructivist theory of knowing, and his analysis of the behaviour of children provided the idea that the human mind can learn according to the individual's developmental level. According to Piaget, an individual interacts with his or her environment and has to adapt an incoming stimulus (information) within his or her cognitive structure. The main role in adapting to information is played by the schema (or schemata). The schema can be explained as the cognitive structure which can categorise pieces of information. The natural impulse of the human mind is to assimilate new pieces of information of a similar structure into existing schemata. If the information is radically new (in a situation where the individual has never come across a certain phenomenon before), then it cannot be assimilated into existing schemata. At this moment, the individual may experience the disequilibration effect, a state of imbalance between assimilation and accommodation which can be rather unpleasant, after which the individual tries to return to a state of equilibrium. In this situation, there can be two possible options: a new schema can be created, or an existing schema can be modified to allow for the acceptance of the new stimulus. Both cases can be classified as the accommodation effect, and can be treated as examples of the development of the cognitive system (Wadsworth, 1996).

Although Piaget's learning principles of assimilation and accommodation were developed based on how children develop their cognitive structures, the theory has also been used for the analysis of adult cognitive processes (Reinking et al., 2000; Pershl, 2007; Moskaliuk, Matschke, 2017).

Adult learning analysis also shows that the level of cognitive development can vary drastically with relation to one's experience, patterns, beliefs and values. Sometimes, an individual only has the ability to assimilate, rather than accommodate, new information, which 'leads to responses that may be puzzling or frustrating to those who have achieved a more mature developmental level' (Reinking et al., 2000, 119). In other words, accommodation can lead to a new conceptual understanding, and a new form of identity formation or existential learning (Pershl, 2007).

Accommodation, as the process of the development of the mental structure(s) influenced by RNI, leads to the creation of personal knowledge from RNI, but this does not mean that the information shifts directly into knowledge. The new thinking structure allows information to proceed (Winner, 2001) and to be conceptualised into internal knowledge by using critical thinking and reasoning according to the knowledge, skills, attitudes and values that the individual already has (Boisit, Canals, 2004; Du Rietz, 2018).

It is important to note that accommodation in itself represents a more complex cognitive process. Therefore, it requires a more detailed analysis. Prawat's (1996) theory can be used for this purpose. Prawat explains that the process of accommodation goes through four main stages: 1) perturbation (which might be experienced as the denial of inner sabotage experienced as inner resistance); 2) action (a practical activity which allows for some results to be produced); 3) reflective abstraction (reflecting on the gathered results); and 4) schema formation (understanding the final result as the new understanding, or skill development). An often-encountered problem with this process is that the perturbation phase can be so traumatic that the opportunity to learn may be dismissed by the adult learner, and a more common (reactive) problem-solving strategy can be used instead.

Furthermore, to assist students in accommodation, it is necessary to enable them to construct products as a result of their knowledge, skills and values development, as well as involving them in the implementation of creativity in solving the challenge suggested by the teacher (Papert, Harel, 1991). The essence of constructionism is expressed in Papert's idea that it is important to engage the individual in the 'personal construction of something' which will be 'rich enough' in the mind (ibid). This means that 'learning is more effective when learners are engaged in designing or constructing some tangible' (Ang, Zaphiris, Wilson, 2011, 539). It does not matter if this is a material thing or a virtual or abstract object. The most

important aspect is what kind of object the learner prefers to make as a meaningful product.

However, in understanding that the accommodation process might encounter strong resistance, educators are left with the open question of how to assist learners by easing the accommodation process, while researchers are interested in the actions that empower developmental models for the accommodation.

In the search for the answers to these important questions, it is necessary to look deeper at the previous research by the authors of current paper (Kubova-Semaka, Jucevičienė, 2021) on the development of education students' competence in using potential learning environments, for which the SESEP was used.

3. A new glance at the SESEP according to the process of accommodation

The SESEP was developed through the delivery of a course to master's students in education at university in Lithuania during the autumn semester of 2020, in which one of the main subjects was life-long and life-wide learning with the use of potential learning environments (PoLEs).

The PoLE concept has been developed as one of the elements of the *Educational and learning environments* theory (Jucevičienė, 2008). According to ELE theory, PoLEs are environments containing information which *may or may not* be used by the individual for personal learning. By analysing the environments the individuals are at or in, the ELE theory looks at the environment from a life-long and life-wide perspective as only the *potential* for learning. As Jucevičienė (*ibid*) explains, the concept of a *potential learning environment* is extremely different to the concept of a *learning environment* used in the information technology field (Ream, Ream, 2005; Tu et al., 2012; Zandvliet, Broekhuizen, 2017). The PoLE does not mean that learning is going on yet; it only means that the individual's learning *could be* going on if he or she purposely or not-purposely uses the PoLE (or some part of it), accepting it as a personal learning environment (PeLE). From the perspective of ELE theory, the PeLE is also a different concept compared with the understanding of a *learning environment*, how it is used in the field of information technology (Attwell, 2007), or by further conceptual developments (Fiedler, Väljataga, 2020).

The ELE theory is useful to learn for future teachers, but students usually face huge difficulty when learning the ELE theory. *The Seven steps educational process* helps them to overcome these difficulties and learn successfully.

As was already mentioned above, in their previous work (Kubova, Jucevičienė, 2021) the authors of the current paper researched the case of a course delivered to master's students in education who were learning to use PoLEs. The aim of the research was to reveal how students develop their competence to use PoLEs.

This course was planned, organised and implemented by a highly experienced teacher in the field of education, and a teacher's assistant aided students in their practical assignments. The course became the subject of empirical research based on Remenyi's (2013) single case study with multiple embedded units (21 students), and the methods implemented in the empirical research were: document analysis, semi-structured interview, and observation. One of the results of this empirical research was the revelation of the essential structure (based on the seven steps) of the educational process (EP), which was essential for the development of students' competence to identify and use PoLEs (Kubova-Semaka, Jucevičienė, 2021). An additional result, not expected while designing the research, was the evidence of the accommodation process. This discloses the very likely broader possibilities of the SESEP.

In the current paper, the SESEP is presented based on secondary analysis by drawing out the process of learning of RNI by accommodation while developing the competence to use PoLEs (Fig. 1). Fig. 1 is divided into two main parts: on the left is the teacher's part, with their actions in pursuit of specific educational tasks; and on the right are the students' activities, results and reactions.

Each step of the SESEP is presented in more detail below.

The SESEP from the perspective of the process of learning RNI as accommodation:

1. The first step of the EP was to activate students' experience in the context of ELE theory, which was expressed in teachers setting a task for students to describe the example of the best case of learning from personal life experience. The discussion of the cases provided by students was successful, and showed that most of the students became interested in the task and showed positive reactions to describing their experience. The teacher was satisfied with the results, and was willing to go from practice to theory in the second step of the SESEP.
2. The second step of the SESEP was, from the teacher's perspective, to present radically new information, the theoretical concepts of ELE theory. While explaining ELE theory, the teacher used the examples described by students in their best cases of learning, and activated the discussion by using targeted questions. Although the students discussed the main concepts of ELE theory in this group discussion, they already expressed an actively negative reaction, the idea that this theory was 'too difficult to understand', 'meaningless', etc, and demonstrated a desire to reject it. Their reactions were concurrent with what Prawat (1996) calls perturbation, the first step in accommodation. However, the teacher was able to refocus the students' attention on the next step: asking students to apply ELE theory (by giving some instruction).

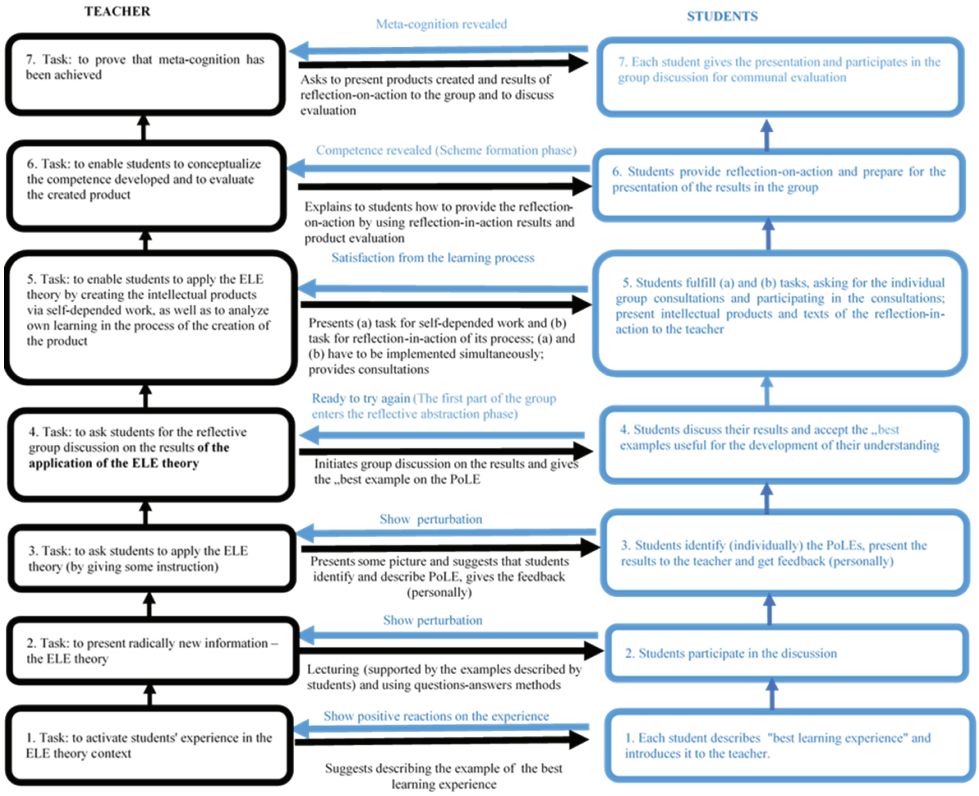

Figure 1. The SESEP model for the development of students' competence to use PoLEs from the perspective of learning RNI (scheme constructed by the authors of the paper)

3. The essence of the third step was to focus the students' attention on the second phase of accommodation: action (Prawat, 1996). Thus, the students needed to individually identify PoLEs, present the results to the teacher, and receive personal feedback. Although perturbation reactions were noticeably explicit during this stage, the personal feedback given to each student by the teacher created an environment for the further reflective abstraction (Prawat, 1996) phase. It is widely known that students' emotions correlate with their level of engagement with the learning task. 'Negative emotions such as stress and anxiety often hinder their engagement with assessments, while positive emotions like pleasure and excitement help motivate students (Lynam, Cachia, 2018, 230). However, negative emotions (such as anxiety or a feeling of uncertainty) are a natural attribute of perturbation. Nevertheless, personal feedback allowed the students to reduce the strength of the pertur-

bation effect, and to make the first conclusions as to how their PoLEs should be identified and described. As a result, 20 out of 21 students managed to identify and describe their PoLEs on time. One student did not complete the task on-time due to her workload, and missed the opportunity to move to the action phase, which made her perturbation phase last much longer. The strength of personal feedback is very important, as 'relationships and emotional processes affect how and what we learn' (Durlack et al., 2011, 405).

4. The next step of the SESEP was to ask students for a reflective group discussion on the results of the application of ELE theory. The teacher initiated a group discussion of the results, and at the end gave the best example of a PoLE. This allowed for the initiation of collaborative learning, where students shared their best examples of PoLEs with the group, which helped them to understand why it was necessary to identify and describe PoLEs. At this stage, the students prepared for a new task, and more than half the group (13 out of 21 students) stated that in terms of their competence to identify and describe PLEs, they were approaching the reflective abstraction phase (here their wording was interpreted into this term, which was described by Prawat [1996] as the third stage of accommodation).
5. For the fifth step, the teacher set a task that enabled students to apply ELE theory by creating intellectual products via independent work (Papert, Harel, 1991), and to analyse their own learning in the process of the creation of the product. The essence of this self-dependent work was to create three PoLEs for potential users: a) one for the student themselves; b) one for another person (freely selected by each student); and c) one example of the transformation of a PoLE into an educational environment (EE). Additionally, they received the parallel task of performing reflection-in-action (Schön, 2001) during the process of finding and describing the three PoLEs for the potential target groups. This means that at every step of each task involving the identification and use of PoLEs, students had to ask questions such as: 'What knowledge, skills, competences, attitudes and values have been used and/or developed?', 'How and why have they been used and/or developed?', and 'What would it be possible to do better?' and write their answers in their learning diaries. Students were equipped with methodological support prepared in advance by their teacher. These new, more elaborate tasks (especially reflection-in-action) began a new phase of perturbation. However, due to their existing positive experience, it was now much easier to redirect students towards the action phase. Furthermore, during these tasks, students had the opportunity to receive consultations in three possible ways: group consultation, personal consultation with the teacher's assistant,

or personal consultation with the teacher. This was an important initiative, as it allowed students to choose group or personal consultations, giving them the opportunity to ask any questions they had and to fill in the gaps in their understanding. In other words, the consultations helped to develop new schemata in students' thinking structures, and provided positive support to students, which was an essential form of assistance while experiencing the accommodation process. All 21 students participated in the group consultations, and 19 out of 21 students decided to seek a personal consultation with the teacher or the teacher's assistant. As a result, all 21 students managed to complete their task, and to create three different intellectual products (Papert, Harel, 1991): a PoLE for themselves, a PoLE for others, and the transformation of a PoLE into an EE. The PoLEs that students had created were evaluated and accepted by the teacher as examples of proof that the competence to use PoLEs had been developed. The results of students' interviews show that reflection-in-action, as 'stop-and- think' (Schön, 2001) was extremely important for them in recognising the ongoing process of learning during the task. Of course, reflection-in-action elicited some perturbation reactions, as this kind of practice had never been used by the researched students before (therefore, it could also be treated as RNI). The tool that helped to complete this task was the implementation of personal and group consultations during this stage. As a result, students successfully developed learning diaries, allowing them to capture the development of their competence to identify and use PoLEs during the creation of intellectual products. Already at this stage, 15 out of 21 students reached the reflective abstraction phase (Prawat, 1996).

6. The sixth step was targeted at enabling students to conceptualise the competence developed, and to evaluate the created product by using reflection-on-action, as 'after-the-event thinking' (Moghaddam, Davoudi, Adel, Amirian, 2020). The teacher explained to the students how to conduct reflection-on-action by using the results of reflection-in-action and the evaluation of their products. The students were encouraged to refresh their experiences and to go through their learning diaries (the results of the reflection-in-action process), to summarise their learning, and to provide self-evaluation of the PoLE products that they had created. They were equipped with the methodology of how to perform this.
7. The seventh step was targeted towards proving that meta-cognition is achieved by students' presentation of the products created, the results of reflection-on-action, and participation in the group discussion for the common evaluation of the results of learning. Each student presented a generalisation

of the difficulties and achievements of their learning process, the creation of their products, and the self-evaluation of the quality of their products. Presentations were given to the rest of the group of students, and were followed by group discussion. The observation of the presentations and discussion, as well as content analysis of the diaries and the evaluation of the products, allowed the researchers to recognise that the sixth step encouraged triple-loop learning (Peschl, 2007) and the externalisation of tacit knowledge with the ability to understand what was learnt and developed during the production period, how, and why. This kind of learning not only allows cognitive thinking structures to be changed, but also helps students to reach an understanding of personal knowledge, skills, attitudes and values, which leads to individual cultivation and the sort of learning that helps to accommodate not only knowledge but also wisdom (Peschl, 2007). At this stage, 19 out of 21 students managed to develop the competence to identify and use PoLEs by applying ELE theory. This activity was an essential reflection phase, allowing them to re-evaluate the essence of their learning experience and to make important conclusions about themselves and their meta-learning competences for the future. In other words, this stage endorsed the idea that the essence of meta-cognition is of primary importance for initiating and developing a learning self-identity (Kolb, Kolb, 2009) in the consciousness of students, not only facilitating their ability to cope with RNI, but also enabling their awareness of their learning style, learning space, and learning flexibility (Kolb, Kolb, ibid). Everything revealed in the seventh stage of the SESEP allows us to draw the conclusion that the fourth stage of accommodation, the formation of schemata (Prawat, 1996), was successfully implemented.

Putting it concisely, it can be concluded that, in fostering accommodation, it is not enough just to transfer knowledge, develop skills, or assist in the learning of new strategies: 'the mind is like a thirsty mule, unwilling to drink even when it has been brought to the water' (Alcorn, 2013, 9). It could be that the accommodation process requires the educator to engender profound existential change and 'presencing' (Senge et al., 2004; Peschl, 2007), allowing one to see the more profound objectives of learning, with a view to changing personal perception and leading to individual cultivation, or triple-loop learning (Peschl, 2007).

The SESEP could be helpful both to teachers and students for developing understanding and initiating, supporting and finalising the learning process in situations where RNI is part of an education course, but it could also cause resistance from students, due to the absence of a specific cognitive structure.

The SESEP could be used as a guide on how to lead the process of accommodation in dealing with RNI in other fields of study. As was discussed above, business and management studies are of extreme importance, because their graduates are expected to be leaders of contemporary organisations, to work daily as knowledge professionals, and to help others work with radical innovations, which invariably contain RNI.

4. Expert views on the possibility to adapt the SESEP to enable learning by students of business and management when facing the challenge of accommodation

Can the main ideas of the SESEP be used for business and management courses in which students' learning is challenged by RNI? This was the research question investigated in this section.

The method for answering this was as follows: first, five experts, highly experienced university teachers in business and management, were interviewed (see Table 1); second, the results of these interviews and the SESEP were discussed, and this discussion was supported by literature sources.

The expert teachers who were interviewed each represented different courses (first and second-year master's courses, first to fourth-year bachelor's courses), which provided the opportunity to see the perspective of teachers working with different student groups.

The thematic analysis of the expert interviews revealed that, in most cases, when students face RNI, they feel perturbation, including 'an unpleasant feeling of not understanding information' (Expert 1), 'silent anxiety' (Experts 2 and 3), 'no reaction, or an exhausted feeling' (Expert 4), and 'silence or a negative reaction; or the reaction of one student, who remarked "I will be an engineer, why I should learn this?"' (Expert 5). As usual, teachers try to manage perturbation by using different methods and ways of teaching, including demonstrating via practical examples (Experts 1, 2, 3, 4 and 5), showing that there is no universal truth (Expert 1), repeating the explanation (Experts 3 and 5), directing provocative or Socratic questions towards students (Experts 1, 2, and 4), using problem-based teaching (Expert 4), conducting debates (Expert 2), applying appealing methods by using video materials from the internet (Expert 4), setting projects that involve the creation of intellectual products (Expert 1, 4 and 5), providing individual consultations (Experts 2, 3 and 5), providing group consultations (Expert 5), conducting debates and voting for the best student project (Expert 1), and asking questions initiating reflection at the end of a lecture (Expert 4).

Table 1. Characteristics of the experts, their courses, and the students that participated in them.

No	Expert's position and teaching experience at university	The course analyzed by the expert: subject and RNI for students	The students that participated in the course
1.	Full professor; more than 30 years	Strategic management; RNI for the majority of students	Master's degree students in business; 1st year of study; around 120 students; high motivation for study in general; around half had 2–3 years of working experience
2.	Full professor; 10 years	Business evaluation and relationship development with the investors; RNI for around half of students	Master's degree students in management; 2nd year of study; around 120 students; very high motivation for study in general; around 5 years of working experience
3.	Assoc. professor; more than 10 years	Introduction to economics; 80–90% of information is RNI to 20% of students	Bachelor's degree students; 1st year of study; around 40 students; high motivation for study in general; no or very little (0–2 years) working experience
4.	Assoc. professor; more than 15 years	Business and entrepreneurship; majority of information is RNI since the students come from different study programs	Master's degree students; 1st year of study; around 20 students; average motivation for study in general; students from different study programs
5.	Assoc. professor; 7 years	Technology and entrepreneurship: RNI for the majority of students	High diversity: students from different bachelor programs and different years of study (1st–4th year); 25–250 people on the course

Source: The authors of the paper

All five experts noted that the SESEP could be used successfully in business and management courses if a number of conditions can be implemented. First, the course should contain RNI for students which requires the creation of a new mental model. The number of students in the group should be limited (no more than 40), or there should be additional education specialists assisting the teacher with the implementation of the model. The group should be divided into sub-groups according to the level of competence of the students, as diversified groups might vary in their level of knowledge, and some students might be able to assimilate new information without the need to accommodate it. Students should have ambitious goals, which could involve the creation of intellectual products enabling the development of students' capabilities, competences and creativity. The SESEP requires enough time for accommodation to take place, so the course should last for at least one semester (about 16 weeks). There should also be time for students

to reflect, both in terms of reflection-in-action and reflection-on-action. Teachers and students have to have some additional competences for the implementation of the SESEP, including knowing the essence of accommodation, its reasons and its process, and knowing active methods of teaching/learning. The importance of the SESEP has been pointed out for 'hands-on' modules, particularly for courses which aim to enable students to solve practical problems based on RNI. The adaptation of the SESEP to the ENARNI model for business and management studies also calls for its discussion by approaching theoretical sources.

5. Discussion: from the SESEP to the ENARNI model when facing RNI

The first step in the SESEP is in activating students' experiences as a preparation for RNI. Students should be asked to share their experience in the field of knowledge which works for the teacher in order to show that such a type of thinking is useful in a particular context, but cannot work in different circumstances. The activation of the student's experience, which is as close as possible to the RNI area but at the same time different, is targeted at concentrating their attention on the new area of knowledge, and even increasing their motivation to learn the RNI. This can be achieved by posing questions with the aim of challenging students' thinking as to how it is important to obtain the new knowledge, even if it changes their present understanding. At the same time, it is important to show that the present understanding is useful in dealing with some groups of problems, but this does not work if the individual faces new kinds of problems which require absolutely new kinds of thinking. This step can be termed the initial motivation of students for RNI (Fig. 2). Unfortunately, it is not easy to achieve the expected result, and the reason for this can be explained from the perspective of Vygotsky's (1978) theory. Vygotsky described three levels of individual development: a) the actual level of development, when knowledge is used only to complete a task, but not developed; this means that learning did not occur; b) the zone of proximal development, when the individual has some knowledge as a background to complete the task of learning, but at the same time lacks some knowledge, and therefore has to learn and is able to do so self-dependently; and c) the potential level of development; this means that the individual lacks the essential knowledge to complete the task, and therefore he or she is not able to learn self-dependently, and learning can only occur if the individual receives permanent help from his or her peers (a teacher, classmates who know better, etc). Logically, the lack of the necessary mental models for learning RNI means that an individual is at the potential level of development with relation to RNI.

At the same time, it is also important to organise the rest of the steps to know that the educational process has to be implemented for individuals who are at the potential level of development.

The second step is devoted to a presentation of the RNI. As Sinha and Kapur note, learning new concepts can be implemented by two strategies: 'when students engage in problem solving followed by instruction […] or instruction followed by problem solving' (Sinha, Kapur, 2021, 761). The researchers (Sinha, Kapur, 2021) have arguments for the first strategy. Kirschner and his colleagues (Kirschner et al., 2006) give arguments for the second strategy. The choice of the second strategy (first instruction, second problem solving) for the second step of the ENARNI is based on the need to follow Prawat's (1996) stages of the accommodation. It means that instruction as a presentation of the RNI will probably cause perturbation as the first stage of accommodation (Prawat, 1996).

Therefore, *the third step*, the application of the RNI, is highly important, as was acknowledged by all five experts interviewed. Here, it is appropriate to use the idea of Kessels and Korthagen (1996), that learners understand more easily not general conceptions, which are described for a wide variety of situations, but conceptions which relate to particular situations. Therefore, the teacher should select very clear examples that emphasise specific situations in the application of theoretical knowledge, and invite students to analyse the examples when creating a so-called 'problem space' by questioning the students and encouraging them to question (Chin, Chia, 2004).

The fourth step is closely related to the third, and is focused on reflective group discussion on the results of application. It is important to remember that learning in a group assists students in shifting from the level of potential development to the zone of proximal development (Burkšienė, 2011). Therefore, it can be expected that some students will proceed to the next stage of accommodation, action (Prawat, 1996), but some may still remain in the perturbation stage. To solve this challenge, the teacher should consider the collaborative steps that could be taken involving both sides, teacher and students.

As has already been observed in the analysis of the SESEP, conceptual thinking develops by *learning by making*, which is explained by the theory of constructionism (Papert, Harel, 1991). Thus, the involvement of students in project activities in *the fifth step* is especially important. This is emphasised by both SESEP analysis and expert interviews. For students to move to the next, third stage of accommodation, i.e. reflective abstraction (Prawat, 1996), their activities of 'learning by making' (the second stage of the accommodation) need to be not only successful, but to create an understanding of the actions for 'product making'. Students have to recognise their own experiences 'of making sense in this – of craft as a dyna-

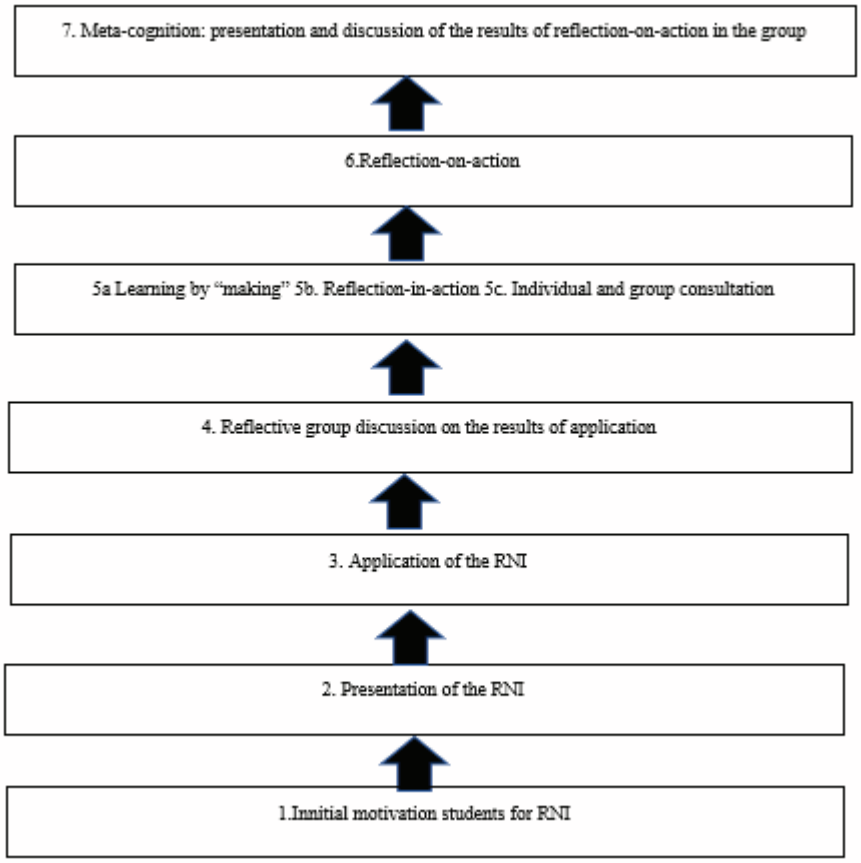

Figure 2. The ENARNI model (compiled by the authors of the paper)

mic process of learning and understanding through material experience' (Gray, Burnett, 2009, 50). Students have to be purposeful to conduct reflection-in-action, so the teacher has to propose not only a project activity task (5a), but also a reflection-in-action (5b) task that is performed in a similar way to the SESEP. As both project activities and reflection-in-action can pose certain challenges for students, it is important to ensure comprehensive student consultations (5c), offering both individual and group options. Thus, the fifth step actually consists of three parallel activities (5a, 5b and 5c). By organising the educational process in this way, it can be expected that most students will be able to come to the reflective abstraction phase.

The sixth step is to conceptualise the knowledge gained by students through the accommodation process. Therefore, students complete a reflection-on-action task in a similar way as in the case of the SESEP. This activity is what Prawat (1996) calls reflective abstraction. This is based on an analysis of the results of reflection-in-action, reaching understanding as 'making sense' (Gray, Burnett, 2009) of: a) the product created (What are its peculiarities? Quality?); b) the knowledge, skills and attitudes developed while 'thing making'; and c) how the product can be improved and what kind of competences are needed for this.

The seventh step is the oral presentation and group discussion of the results of the sixth step. 'Connected knowing' is reached when individuals are oriented towards relationships and are assessing each other's knowledge with empathy (Belenky, Clinchy, Goldberger, Tarule, 1997). This also helps them to recognise explicitly that they started to think in a new way. This ensures that students have formed new mental models. By analysing the SESEP case, it was found that students considered this last step to be especially important, as looking at oneself from the sidelines and through the eyes of others helped students to understand the process of learning RNI and to form conceptual knowledge based on it. Thus, it is realistic that in step 7 the final accommodation stage, schema formation (Prawat, 1996), is attained.

Conclusions

An important part of the competence of students as future managers and business leaders working in contemporary organisations is not only to be able to accept RNI on their own, but also to understand why other employees experience difficulties in dealing with RNI, and to help them overcome learning problems. The university, college or business school has to ensure the development of such a competence as part of business and management study programmes. For this purpose, in courses where students are dealing with radically new information, it is appropriate to apply a special educational approach, the ENARNI model. This model not only helps students develop the new structures of thinking needed to learn RNI, but also helps them to understand how the process of learning that is itself developing these new structures of thinking takes place. In this way, students not only avoid problems during the study process, but can also gain the additional competence to implement radical innovations in future work organisations.

The ENARNI consists of seven steps: 1) initial motivation for RNI; 2) presentation of RNI; 3) application of RNI; 4) reflective group discussion on the application results; 5) a) learning by making, b) reflection-in-action, c) individual and group consultation; 6) reflection-on-action; and 7) meta-cognition. All of these

steps require high subject and educational competences on the part of the teacher. The students also need to have some competences for active learning, especially important are reflection-in-action and reflection-on-action skills, as well as knowledge of the peculiarities of the learning process when the individual faces RNI.

The application of the ENARNI is also linked to certain recommendations that business and management studies administrators should consider before its application. First, such studies should be implemented in small or medium-size groups of students if possible. Teachers have to be provided with the opportunity to acquire the competences required for the application of the ENARNI. It is recommended that business and management teachers should have assistants, educational professionals, to help them when needed, particularly when courses are conducted for large groups (in this case, students should be divided into smaller groups for discussion and consultation). On starting to study at a university, college or business school, students should be given the opportunity to acquire the learning-based knowledge and skills needed for contemporary studies. The ENARNI as a teaching/learning system should be included in the curricula of courses where RNI prevails for students. Such study programmes should not be a short cycle, but should be taught throughout the semester, so that students have time to construct new thinking structures.

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