

The Project-Based Learning Course in Educational Organizations: A Challenge for Learners & Tutors

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Abstract

The nationwide introduction of the "project" course in the Greek secondary education system has been recorded as one of the major innovations, within the form of public setting, forcibly applied downwards from government level. This initiative leads inevitably to the redesign of the national curriculum in mandatory education and influences timetable construction and thus everyday school operations. By that way, it does not only change the learning philosophy but also the classroom practices inside greek institutions. Many scholars consider the "project" course as a locomotive to a major transformation of the formal educational system. Supposing that it is a permanent setting, gradually applying to the whole spectrum of school curricula, we tried to measure its impact and consequences and elucidated to the deeper changes it may occur. To achieve this, we conducted a small scale survey, among tutors that undertook this course last semester, and recorded their opinions. Within this, we achieved to decode and transfer their unique and valuable experiences. Qualitative and quantitative results are also presented here, after sufficient scientific scrutiny. The conclusions, in general, do not favor deployment of the course at this, but there are slits of hope that, under certain circumstances, stable characteristics of sustainable innovation can emerge here.

Keywords: project, innovation, inquiry learning, induction

Introduction

It is widely observed that demands of our knowledge society, posed on educational systems, are constantly increasing. The call of our epoch is for a fully transformed education, a renewed curriculum and highly-efficient instructors. Those three requirements are quite necessary to achieve the predefined goals, but also to challenge the tidal waves of rapid change traditional institutions are facing.

Within this frame of thought, the Greek educational system has recently introduced a new course to it's upper level of secondary education, that will gradually expand to all grades of lower and upper secondary education. It is the leading key for the transformation to a "new, digital school", according to the declarations of Ministry of Education officials. This course is inter-disciplinary and named "project". It is a new educational practice fully compatible with contemporary didactic orientations, that also applies to other countries as well.

Every such series of intervention policies inside the educational system, that is based upon pioneering and novel principles and ideas and through these can cause a positive impact on mentality, practice and roles and school culture, in general, can be considered as educational innovation. "Project" course is definitely an integral part of school innovation because it is founded on pedagogic principles which dominated a few decades ago scholar systems abroad, and created a new field characterized by active student involvement, choice of learning paths, critical and constructive thinking and connection of personal experiences to running school knowledge and real circumstances of life.

This new frame of instruction realizes students as small "scientists" and "researchers", who are closely cooperating, take over initiatives and approximate school knowledge through different ways such as scientific inquiries, experimentations, inter-disciplinary queries and personalized-customized learning paths. This is an innovative approach, regarding the bureaucratic, static greek educational system, we experiencing the last decades.

Can such a small scale interference affect our large picture for the system? A careful observer can state that small niches of innovation can create considerable dynamics to the large scale. It can also work as a leading example towards the redesign of the whole curricula in secondary education. As we will discover, this can be true, under certain circumstances, because the problems that can endanger the situation still remain. We can overcome them by carefully designing and applying this initiative.

Theoretical Basis

The "project" idea is based mainly on the theoretical basis of collaborative learning and is operationally connected to the scientific notion of "project" in management and economic studies. The idea is not new. It had been first coined out at the 70's in an application to Medical School education (Barows & Tumplyn, 1980), where it emphasized on hypothetical deductive reasoning process, but it did not meet then very much success.

The reason that its recent resurgence is so successful is that two new things have been brought up in the last two decades: first, information society with its cutting edge ICT tools, that makes ease to create, enrich, review and share documents/information of any kind (Contini & Lazarna, 2009). ICT introduction in schools is already experiencing its third decade and everyone thinks that its contribution is so far indispensable. Second, the idea of New Public Management (NPM for short) that is actually transforming operations and structure of PSEO¹'s (Windrum & Koch, 2008). The NPM approach incorporates elements of private sector creating a dynamic mixed schema e.g. establishes professional learning contracts, engages all stakeholders in a common effort, redefines leadership - managerial roles and creates strong capacity-building teams at all levels of the organization.

For the current conditions inside Greek institutions, the newly inaugurated project-course offers a fresh look, based on the following three pedagogic principles (Matsagouras, 2011):

¹ acronym for Public Sector Educational Organization

- 1 the principle of inquiry learning approach
- 2 the principle of inter-disciplinary teacher corporation
- 3 the principle of student-team cooperation

The first principle refers to alternative learning approaches, which methodologically set out posing queries of broader interest (for our natural and social environment) and proceed exploiting methodological and conceptual tools in order to research available data, answer those queries, suggest solutions and make decisions for real complex situations. The second principle corresponds to the need for orbiculate understanding of the real world as a compound of discrete entities which interact and complement each other. The importance of inter-disciplinary approach for education is unique, because it helps students overcome the separations of different fields and learn to use validity arguments of natural sciences, interpretative schemata of social sciences, aesthetic evaluations of art and value assessment rules of morality at the same time (Morin, 2000). The third principle transposes the learning process from the teacher-student communication channel to student-student part. So, teacher becomes supporter and manager of learning process.

These features explain why the "project" course has such wide application in recent decades, in all levels of education, in many different countries. Relevant scientific literature (Kellest, 2005), stating the significance of the "project" course, among other things, reports that:

- it stimulates student thinking, creativity and initiative, through direct and active involvement in all phases of course-work
- it increases the interest of students for the other courses, because they actually realize the contribution of curriculum to the understanding of the real world and to the treatment of everyday problems and major issues of life, in local and global level
- it engages students within thinking culture of specialties, as the purpose of education requires, in original working conditions
- it aims at developing reflective, critical and self-critical thinking and personal responsibility around human choices and actions, the dominant socio-cultural pattern and moral dilemmata in modern societies
- it promotes collaboration and collegiality, given that students in this course work together in groups to study issues, to create artistic compositions and manufactur various artifacts
- it creates channels of communication between school and local community, thus implementing in action the model of "open"school

In practice, in order to reach an effectively worked-out project, three basic procedures must be followed (Patton, 2012): a) students can be able to create numerous versions of their work (drafts) before producing a final product b) there must be frequent opportunities to critique each others' work inside and between teams and c) the final product is exhibited publicly in the community and thus is subjected to open air criticism. These three things - redrafting, critique, exhibition - are critical, because they instil ethos of hard and high-quality work in both students and staff, at the same time they create a culture of cooperation and excellence.

If anyone applies all these principles carefully and coordinated, with preparation and focus, then he can expect to observe a spectacular transformation in the learning field: students slowly change their passive behavior and become active members of the process, redefining

together with the teacher-coordinator its educational targets. So, the role of teacher follows a fading scaffolding track (Hmelo-Silver et al., 2007): he teaches less, motivates and assigns more and generally sets the cognitive frame that the students can understand and work within. So his role is less critical (e.g. in judging right or wrong), but acts more as interpretive and animator. This slight wave of transition we hope to prove in action.

Research Methodology

The target choice of our survey was supported by the theoretical background, developed in the previous paragraph, and especially by the presumed significance of "project" course. One group of questions, emerging this premise, state: In what way is the course pedagogic useful for students and tutors? Does it help them create new learning pathways? Which elements are by nature original and pioneer, so that the term "innovation" is justified? Are there obstacles that prevent this synergy of achieving its primary goals? How can one overcome these impediments? Is this new practice viable and sustainable in the foreseeable future? And further expanding our reasoning, we could ask whether the change it brings can be disseminated in larger scale? Can it sustain itself, incorporating its useful characteristics and throwing its disadvantages? If the answer is yes, under which circumstances can this happen?

It is an ambitious set of research questions. In order to answer (some of) them, we conducted a small scale survey using tutors as our target group. A number of 50 teachers from two different types of secondary education level schools (general - technological lyceum and lower-upper level) were chosen to participate. To conduct this survey, the method of electronic questionnaire through the web was chosen. According to this method, we uploaded to our school server an answering form containing 21 elaborate questions, addressed to the tutors of the "project" course during the last academic year (from September 2011 until to June 2012). The questionnaire contained a mixture of close and open questions, covering our research objectives. The close questions, which are the majority, are measuring interval levels, from 1 to 5, according to Likert response scale (Cohen et al, 2007).

During questionnaire design, quantitative data collection methods was in mind (Saunders et al., 2009), following necessary question codification. In some questions, one can not avoid further clarifications expressed largely by the interviewer. So it is necessary to incorporate open questions as well, in order to get a complete image of the subject opinion. It was also attempted that questions did not contain any obscure or ambiguous meanings, that would create interpretation problems. At the same time one must be very careful of latent verbal formalities and stereotypes that could show any kind of bias or prejudice.

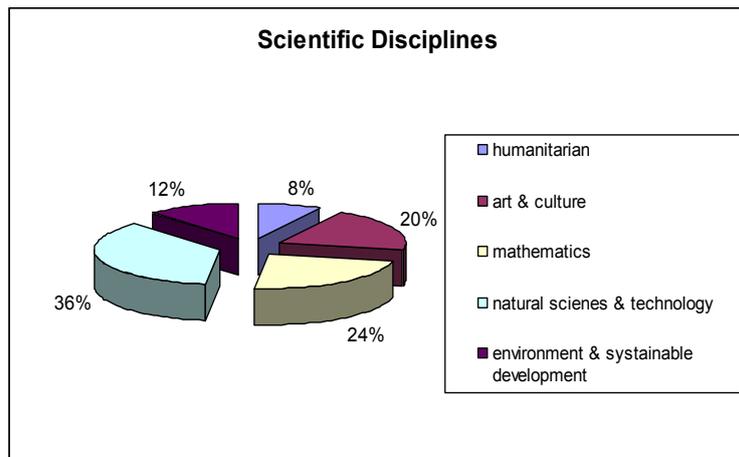
To initiate the process, a kind invitation letter (referencing the accurate questionnaire web address-url) was mailed to each one of them, analyzing research objectives and goals and kindly asking for their participation, meanwhile providing the necessary information for their correct fulfillment. Within this letter, the necessary ethical approval form was attached. The response was really interesting: most of them had visited the website and answered the form within a few weeks from the notification. So, data gathering phase successfully ended after a two-month period. Moreover, most of the tutors asked to participate in the late discussion about research results. In some

exceptional cases, when we thought that questionnaire validity was compromised, we made phone contacts with the interviewers and resolved the problems they had encountered (due to misunderstandings, mostly).

Descriptive Analysis

To accurately analyze quantitative data, we used the standard scientific software tool, especially designed for statistical processing, SPSS version 20. This package is appropriate for closed questions, while other software (e.g. nVivo) can handle data from any open source. From the 50 questionnaires that were completed, 52% were female, 40% were 40-50 years old and 34% stated that had exceeded two decades of service in education. This is the general profile of the target group. We will focus on the most important survey findings.

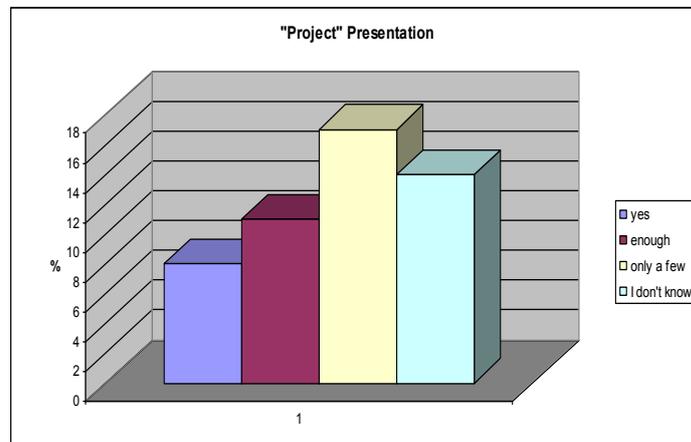
Usually "project" courses vary in their themes, objectives and approaches, so there are many different ways for their classification. From a didactic point of view, we are interested in classifications that are created by the main objective of the work and reflect on the corresponding scientific discipline.



Such categories are the following: humanitarian (8%), art & culture (20%), mathematics (24%), natural sciences & technology (36%) and environment (12%).

Emergence of aim of "project" is important, because it defines, inter alia, types of activities and assessment criteria.

Presentation of "project" results in public, when it is finished, is also a great assessment of the overall procedure. Here it is covered by question #6. The



result, though, is not encouraging: "yes" and "a little" answered only a small 38% of the questioned tutors, that is about one third of the cases. This is an area where more work needs to be done. As we mentioned in previous paragraph, the "open air" exhibition of outcomes (in order to be subjected to criticism), is a vital characteristic of "project" course. This leads to perpetual procedure of redesign and improvement of the work, achieving levels of excellence. The reason for this answer, we hope, is that most tutors have not yet embedded critical parameters of the new course.

Another important issue is investigated by question #12. The issue is whether "project" course should be taught inside the everyday tight

timetable or in a different zone, let's say a "flexible" zone of activities. Most tutors respond here that it is not necessary to create a different zone (48%), while an equally large amount (44%) finds it irrelevant. We could say that another critical element is being misunderstood here, that is the coherence of "project" course to other course in classroom. If we abandon the inter-disciplinary approach, then a major part of the "project" essence will be lost. So, this remains an issue for debate.

Otherwise, we have gathered some (more or less) expected answers, e.g. in question #15 most teachers (75%) declare that they have not received adequate training before they were assigned a "project" course and question #14 regarding their motives, most of them answer the zeal for community & school service. These answers are rather predictable at the early phases of an innovation induction, where unprofessionalism and personal motives substitute statutes and formal procedures.

Inductive Analysis

In this section, we will verify our research as an inductive analysis tool. In fact, we can pose research questions and calculate percentages of truth for them, in aggregation. We can, in the first level, calculate the dispersion of answers around their mean values. Here, it is not meant the average but the weighted mean, that is the product of percentage of every answer times the weight of the answer (1..5) divided by number of questionnaires (50). It is better from here to calculate the variability coefficient, because it is independent from measurement unit. High value of this metric denotes large dispersion (possibly a non-accepted or erroneous result) while small values suggest low answer dispersion and thus greater homogeneity. In the table below, we observe that this metric is moving inside the logical explainable context, for question #16.

Question#	Weighted Average	Variance	Variability coefficient
e16-a	1,74	1,0724	1,2737853
e16-b	3,18	1,1876	1,6363585
e16-c	3,42	1,0836	1,7765546
e16-d	4,12	0,7856	2,2900653
e16-e	4,28	0,6416	2,5827936
e16-f	2,10	1,2900	1,2758946
e16-g	1,96	1,1984	1,2788722
e16-h	3,58	1,2436	1,6966848
e16-i	1,98	0,9796	1,4217008

Let's try to apply some inference statistics, checking if there are interesting relations that can be proved, based on the questionnaire, to be statistically significant. Using SPSS we will check chi square dependence between two variables, the years of service for each teacher and his motives to undertake "project" course. The specialized software gave us the following results:

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8,089 ^a	9	,525
Likelihood Ratio	7,738	9	,561
Linear-by-Linear Association	,670	1	,413
N of Valid Cases	50		

a. 13 cells (81,2%) have expected count less than 5.
The minimum expected count is,56.

Symmetric Measures

	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval Pearson's R	,117	,133	,815	,419 ^c
Ordinal by Ordinal Spearman Correlation	,128	,138	,897	,374 ^c
N of Valid Cases	50			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

These tables display the outcome that there is no significant statistical relationship between the two variables, as suspected.

Interpretation & Discussion On Findings

Trying to aggregate results, we will first make some initial remarks. It is an unanimous belief that the introduction of "project" course can become an innovative school practice, which however needs to be supported in order to flourish and develop, on the long-term. We were actually pleased, with the positive answers received. At the same time, we realized that all education stakeholders have to be asked upon this, in order to express their opinions and concerns. We summarize the basic research findings in the following list, sorted by pros and cons attributes:

PROS

- 1 Project course is a quite new discipline in the greek educational system. However, this is not a novel situation, since many similar attempts have been made in the past. In fact, the whole upper-level education has suffered, during the last decades, periodical unsuccessful transformations, which in most cases failed to synchronize with contemporary needs. So, this is an opportunity to avoid errors from the past.
- 2 Within pedagogy context, two rapid transitions are observed: a) from teacher-oriented to student-oriented way of learning, through the insertion of teamwork method and the adoption of inquiry learning scenarios (though many of teachers are still reluctant to apply teamwork, only 10% gave positive response) and b) from mentality of authority (teacher, textbook) to the cooperative and research culture with multiple content sources and references
- 3 "Project" implementation, although based on different scientific disciplines, has targeted to eliminate barriers in knowledge, bring together techniques and methods from different fields, to abrogate cognitive fragmentations and formalisms.
- 4 The validity issue (methodological and scientific) was an open question for courses being taught traditionally, although they did not lack organizational and applicable capabilities. The "project" course, however, provides this feature also: the tutor can easily

- validate the course, since it can compare methods and results from different areas, and check to see if they can somehow converge. This is, after all, its main advantage
- 5 The discussion about timetable transformation is always productive, since it conceals the modus operandi of an educational organization. The dilemma of placing "project" courses inside current timetable or augmenting them to afternoon hours has not unanimously resolved yet. Both ways have advantages and disadvantages. It depends on the general philosophy of school to decide.
 - 6 "Project" course helped opening a broad conversation for the role of e-learning and generally the usage of electronic sources in education. Most tutors are reluctant to see the fact that young people can equally access knowledge through an electronic display, as well as a paper book. In fact, most young people today feel more comfortable working with digital apparatus than hardcopies. The final answer lies in the immediate digital future, which will inevitably host ubiquitous learning environments, resulting in the terminal abolition of paper.
 - 7 "Project" course can be normally suggested as a unique example of "sustainable" innovation inside the formal educational system. One can think of a number of different factors used for embedding and enriching its features, at a constant rate. Once it has been widely accepted, then it can be augmented with new forms of learning and capacity building, leading finally to a school of excellence and experimentation, open to society, without barriers of any kind.

CONS

- 1 Project course has been adopted without prior, extensive, thorough and supportive teacher training, especially focused to those in-service teachers that will be assigned to (only 6% stated that it has received some kind of training in question #15 and responses to technical term familiarization of question #17 are rather poor).
- 2 "Project" course created gaps and malfunctions in the regular school timetable: in many cases the unwillingness of teachers to undertake the course was obvious, while in many others, course delegation was thought as a easy way to complete weekly schedule (see question 14)
- 3 There is not adequate ICT infrastructure, in many schools, for the simultaneous implementation of "project" course of all teams in A grade (about 30% gives this answer). The problem gets worse with future deployment to B and C grades. There is also lack of educational material appropriate for students. School libraries, educational structures that widely created the last two decades consuming lots of money, were left out of the "project" course, since they lack appropriate staff and their content becomes rapidly obsolete
- 4 Student transportations outside school in order to enrich their research, although quite necessary, are usually problematic. They disrupt the timetable, add more responsibilities to the escort teachers, make the safety issues a first priority.
- 5 Batch assessment of "project" course is unfair for good students, since grades represent team- and not individual- work
- 6 Many teachers report that their students react to the proposed team composition, because they prefer to make up teams by their own criteria. They also say that this leads to dysfunctional teams, which fail to achieve the primary goal of cooperation
- 7 Students with learning disabilities have a hard time to work with their mates inside a team and usually refuse to participate (this is an observation made in qualitative approach)
- 8 In some schools there was difficulty in project topic selection, while some students expressed their annoyance for not having been chosen -even after a draw- to study the topic of their first choice.

- 9 There was reluctance from some students to participate actively in plenary sessions, as they used to work in small groups.
- 10 There is a great discrepancy for the appropriate final outcome report. Some teachers spoke of extended reports of tens of pages while others reported that their students were unable of putting together a few lines of text (especially those in technical upper-level education). Also, problems regarding the final composition and layout of the report were raised
- 11 The credibility issue, regarding research methodology, was a serious problem. It was found that most of the students, and also a significant proportion of teachers, were unable to handle research tools, something that undermines "project" course and its findings.

Future Directions

This initial work provides a first reaction to this new "project" experience. Based on public statements made by the Minister of Education and other officials, one is certain that this scenario has a long way yet to go. Therefore, we conclude with a series of essential hints and suggestions, as a roadmap for education managers and legislators:

- Take full advantage of every available supportive structure and resource (e.g. school libraries) in order to execute the task efficiently. Increase, if possible, the resource pool inside and outside school.
- Immediate educate and train in-service teachers (irrelevant to their subject of expertise) in the implementation of "project" course.
- Implicate quickly school Counselors and Principals, especially to the issue of teacher training in the methodology of scientific research.
- Create a complete internet website for the dissemination of good practices in project course, as well as a communication blog of teachers that teach the subject.
- Implement one-semester theoretical trainings for students on project methodology and then ask them to carry out one.
- Assign the course to two teachers simultaneously, so that there is adequate support, proper monitoring, interference with team operation and normalization of failures that will occur.
- Extend the duration of the "project" course to a whole school year. This will offer the opportunity of greater depth and comprehensive coverage of the topic under investigation. Less time is not enough for the efficient implementation of a research report. Moreover, one can consider the multitude of events that lead to a significant loss of working class hours (which really never get to be replaced).

In a future work, we will examine if these elements can be implemented, in what degree and what will be their impact. We have proved, so far, that "project" course can make the case for a sustainable innovation in large scale, under certain circumstances. We only hope that the budget of Greek Ministry of Education will not be further shrunked, so it can support this, as well as similar initiatives in the immediate future.

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8. Could you briefly describe such problems, if the answer to the above is not "no"?

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9. Did you notice any significant gains for disadvantaged students in your class during the course? Could you say that this kind of teaching attracts / pertains more to students with low performance?

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10. Is there adequate digital infrastructure in you school to support the project course implementation (ICT tools, libraries, labs, e.t.c.)?

yes sometimes no

11. Is the above infrastructure available to you, when you need it? If not, please state why.

yes sometimes no

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12. Do you believe that the creation of a zone of project courses across the school timetable will be:

vital indifferent/insignificant unnecessary

Please justify:

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13. Is there a need for transportation of your students outside the facility for the course? If yes, do these movements create a functional problem in school operation?

yes sometimes no

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14. What was your motive in order to undertake the project course?

- professional interest school/ community service
 innovation/ creativity fill the obligatory teaching hours

Other (fill in).....

15. Have you personally received any training, prior to teach/ supervise that particular course? If you have, how much did this help you in action?

- adequately non-adequate not at all

.....

16. Which of the following teaching strategies have you used in the past? Report your opinion on their appropriateness in your pedagogic context.

Tutor Strategies	Success Factor (1-low, 5-high)
a) Support the personalized, flexible and exploratory learning	
b) Promote active, independent and self-responsible student behavior	
c) Endorse and encourage teamwork, practice in frame of curriculum	
d) Acknowledge and respect different ways and rates of learning	
e) Prepare, organize and schedule your educational and pedagogical duties	
f) Apply collaborative inquiry learning sometime in your carrer	
g) Apply small scale research methods and create subsequent reports with the help of your students	
h) Always increase and update your knowledge, stay informed about developments in your scientific discipline	
i) Create communication channels among other colleagues to reduce the class isolation	

17. Are you familiar with the following scientific terms/ keywords:

e-learning	yes <input type="checkbox"/>	no <input type="checkbox"/>
distance education	yes <input type="checkbox"/>	no <input type="checkbox"/>
web-based training	yes <input type="checkbox"/>	no <input type="checkbox"/>
inquiry learning	yes <input type="checkbox"/>	no <input type="checkbox"/>
problem-based learning	yes <input type="checkbox"/>	no <input type="checkbox"/>
ambient/ ubiquitous learning	yes <input type="checkbox"/>	no <input type="checkbox"/>

blended / augmented reality	yes <input type="checkbox"/>	no <input type="checkbox"/>
research methods and skills	yes <input type="checkbox"/>	no <input type="checkbox"/>

18. If yes, could you provide a free description of anyone of them and comment about possible correlation to project-course idea?

19. Did you study the specific instructions about project course evaluation, contained in the book "Project Innovation in New Lyceum", as approved by the Hellenic Ministry of Education?

yes, thoroughly i took a look no

Comment accordingly:

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20. How do you find the idea of co-supervising the project by two different school teachers? Why?

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21. Please feel free to add any comment, recommendation or suggestion regarding the idea of project course in the upper- secondary level education

Thank you very much for your cooperation!