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A design-based approach to technology education - is it acceptable practice in Russia?

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Abstract

This paper discusses the results of an evaluation of a curriculum development project, aimed at introducing a design-based or 'project' approach to Technology education in one of the central regions in Russia. The work was started four years ago and in October 1999 it was evaluated for the first time. Qualitative methodology has been used for this evaluation, including interviews with students and teachers, project leaders and regional administrators, as well as questionnaires to students and teachers, and analysis of documents.

The findings demonstrate that there is a very positive move in the 'right' direction and that the project has been successful. However, there are some deep, culturally rooted misinterpretations of the intended approach. Two main areas of concern are discussed: understanding of the nature of projects in technology education, and how a new focus on humanisation challenges the traditional epistemological basis of technology education. In the paper the interpretations of the findings are presented within the context of educational reform in Russia. Comparisons are drawn with trends in the practice of UK teachers of Design and Technology.

Keywords: design-based approach, cultural specificity, humanisation, epistemology, students' attitude, methods of teaching

Introduction

This paper discusses a curriculum development project aimed at introducing a design-based or '*project*' approach to Technology education in Nizhny Novgorod, one of the central regions in Russia. The long-term goal of the project is to 'contribute to the development of a humanistic curriculum for Technology education and professional orientation appropriate for Russian schools in the early 21st century'. (Campbell *et al*, 1998) Fifteen pilot schools are involved in the project. Technology teachers from each school have been trained, over a series of eight workshops, to use 'the project approach' – as the central method of Technology education. These projects are supported by (a) 'exercises' in which children learn both generic skills of designing, as well as how to work materials, and (b) 'design analysis' or product analysis. The emphasis is on encouraging children to enquire, think for themselves, take their own decisions and generally be pro-active in their learning, as well as learning how to process materials.

The design-based approach was introduced in the light of Russian Educational Law of 1992. (Yeltsin, 1992) This called for a pedagogy different from the traditional Russian subject of Labour Training, in which the whole emphasis was on the transmission of processing skills, plus associated knowledge. (Pitt and Pavlova, 1997)

The work in Nizhny Novgorod started in 1996. In October 1999 it was evaluated for the first time. The aim of this study was to evaluate how the design-based, or project, approach has been used in the pilot schools.

Methodology

The qualitative methodology employed in this study of evaluation of the design-based approach in the pilot schools of Nizhny Novgorod was a combination of individual and group interviews among the participants of the project, questionnaires, observations, analysis of documents, informal talks in schools and analysis of documents. To ensure the triangulation of analysis, evidence was

gathered using a variety of techniques. The guiding principle of the evaluation was to create a situation which would enable cross-checking between various sources of information in order to achieve reliability and validity.

Data were collected from four schools. Sixty-six students from classes 5 - 7 (ages 11 - 14) completed the questionnaire. There were eight group interviews with students (two in each school, with 3-5 pupils in each group). Boys and girls formed separate groups, as in Russia they usually have different study programmes, with boys concentrating on work with wood, metal and electronics, and girls focusing on working with textiles and food. There were five individual interviews with the teachers, four with the school administrators (principals/vice-principals), and interviews with the programme co-ordinator and consultant. The use of different sources adds to the validity of the results.

There were two questionnaires – one for students, and one for teachers. They were not employed to gather statistical data (some figures were, however, used in analysis to make sense of some tendencies), but, rather, general information concerning the issues connected with respondents' perspective on a design-based approach and some practical information concerning the situation relevant to teachers' teaching practice and students' learning experience. Using questions helped the researcher to be prepared for the interviews and also saved a considerable amount of time.

Semi-structured interviews with teachers were planned. They kept the interview focused, but allowed individual perspectives and experiences to emerge. The first section of the interview schedule, which sought to produce information regarding their practice of using design-based approach during their teaching, was closely aligned to the questions posed in the questionnaire for teachers. The second section was designed to identify the perspectives held by respondents in relation to a design-based approach to technology and some theoretical issues on its relationship with polytechnic principle, humanisation,

curriculum development, and creativity. The final section was aimed to produce data which would reveal respondents' perspectives on the future of technology education and issues associated with the project in which they were involved. All interviews were taped with transcripts being made for analysis a few days later. In all schools access was provided to students' design folios and in some case to actual objects (but most of these had been taken home by children).

Another group in the research was school principals/vice-principals, the project co-ordinator and the consultant. For these participants the practical questions were not employed, but more general questions were asked with a broader picture in mind (design-based approach within the whole school curriculum, the place of technology education in school, trends on the regional level).

Interviews with students were based on several simple questions:

- What is a project?
- What do you like in it?
- How you can characterise lessons of Technology (your attitude to them)?
- How often do you work in groups? Individually?

A series of follow-up question was asked in all cases.

To organise data in a systematic way and in a form which could be analysed and interpreted, a coding system was used. Data were coded in order to develop and redefine tentative themes, ideas and interpretations. Major coding categories were identified. Among them were: use of the project approach by teachers, understanding of the process of design by students, ways of identifying the problem for the projects, the difference between projects and exercises, what has been learnt through the projects (according to the students' view), what has been the influence of the projects on students' personalities, issues connected with the projects (the range of ideas, what do they like more – to design or to make?), problems associated with design folios, with investigation, group work, design analysis, humanisation and project approach,

the polytechnic principle and project approach, positive features of the design-based approach and its limitations, design-based approach as the main approach for curriculum development, career orientation, etc. For the purposes of this paper two categories were chosen – nature of the projects and humanisation of the learning/teaching process.

Educational change can be analysed from a variety of perspectives. We have adopted a cultural analysis approach, rather than a socio-analysis approach, as it appears that cultural factors are the more important – in particular educational traditions and epistemology, and the strong Russian engineering tradition.

Findings

The findings demonstrate that in all schools, the project method is popular and well accepted. Teachers, students, school administrators and parents see it as a valuable and an important method of learning and teaching. The main role is the development of students and, in particular, their creativity. Creativity is a key word associated with the 'project approach'. The results of the study demonstrate that *project activity* has a positive influence on different features of students' personality – both students and teachers emphasise this. Among these characteristics are a creative attitude to the task, initiative, independent thinking, and hard-work. The other positive results include the development of making and designing skills. The basis for professional choices becomes more realistic. Interview data suggest that the introduction of projects increases the status of Technology when compared to other subjects: for example, more school leavers are opting to be examined on their Technology projects when applying to university. Teachers and school administration stress the following positive features of the project approach:

- positive influence on economy
- the possibility of differentiated approach
- the ability to work with a limited resources
- satisfaction of the teacher
- broad possibilities of student development
- the ability to use knowledge from different subjects.

All students (66 children) said that they liked projects very much: "In the project you are not copying, you are searching". During the interviews, boys and girls showed a great interest in working with non-traditional materials (wood and metal for girls, textiles and food for boys). This suggests a need for joint projects in which two or more teachers of technology are involved. It seems that the students are in front of both teachers and curriculum authorities in requesting this change.

However, in this paper we will analyse two main areas of concern that have been identified during the study. Most of the identified problems are connected with Russian educational tradition, despite the fact that the Educational Law of 1992 was aimed (inter alia) at changing this. Changes in the orientation of education, and the using of active methods of teaching, are increasing only slowly in the area of Technology education.

Understanding of the nature of projects in Technology education

The data demonstrate the need to use a variety of approaches towards including projects in the process of learning. This issue is closely connected with the general problem of how to use projects in the current official programme of study, which specifies the making skills to be learned in great detail, and requires that up to 25% of time be spent on the realisation of projects – see Khotuntsev and Simonenko (1995). If this happens at all, it is usually in the last quarter of the school year. The underlying assumption is that students could realise projects only after they have learnt certain skills, and acquired certain knowledge. However, the 15 pilot schools got the right to experiment and try a variety of possibilities.

Teachers are adapting the new method to their existing styles of teaching, in order to minimise the disruption to existing syllabuses and routines. Their strategies involved attempts to realise the goals of the Nizhny Novgorod curriculum development project, by taking advantage of appropriate opportunities, and coping with or adjusting to the constraints.

We have identified three main approaches, used by teachers in the pilot schools, for including projects in the curriculum:

- A – using a closed design brief, aimed at the acquisition of skills. During the projects students learn skills of working with a specific material – wood and food in this case (the skills are specified in the official programme of study), and design skills (Class 5)
- B – using an open brief with limitations on what material could be used (Class 7). Students use skills which they learned during the exercises before the project. They also have to make more design decisions.
- C – using an open brief. Students (Class 6) develop making skills (required by the official programme) during the exercises before the project. During the project students could develop what they want from all sorts of material. These projects reach far beyond traditional themes/objects.

For some teachers the presence of the state curriculum and inspectors seem to constrain them in their approach to classroom teaching. It limits their willingness to explore new teaching strategies with the project approach. However, one of the major problems is that many teachers misinterpret the nature of projects. They think that 'the project approach' is a new didactic method of teaching, one which has its specific and limited place in the programme of study. Each teacher chooses just one way of using projects, and is very critical of the other approaches. They try something and it works, so they do not want to experiment further. The attitude is, "I know the right way to do things, why should I be flexible?"

The difference between 'projects' and 'exercises'

Many students are not clear as to the difference between projects and exercises. This confusion appears in different ways as exemplified in the following attitudes:

- 1 Projects can be realised only on the basis of the knowledge and skills developed before the project: "In the exercise you learn something new, some new stitching

method, in the realisation of the project there is nothing new, you already know everything", "During the exercise we learn how to sew and while realising the project we already knew how to do this", "There is nothing new in the project", "Exercise is the preparation for the project, the project is the realisation". One of the teachers mentioned that if the student does not know how to use a certain tool for the realisation of their project, the teacher should find another way of solving the problem, or postpone the project until the next year when this skill will be learned. The idea that new skills and knowledge might be acquired *during* a project is not considered.

- 2 The project should be without mistakes, as its realisation is for assessment purposes. This is in contrast to exercises: "In the project we are sewing for the assessment, in the exercise - not", "The project should be without mistakes" as it is the exam.
- 3 The teacher does not help much during projects as she/he considers the project as the assessment unit: "When we are doing exercises our teacher helps us, when we are doing the project - it is an independent piece of work".
- 4 The exercise is the practice, the project is the associated theory. The students consider a 'project' as the designing of a product, without its realisation.

These understandings of students could play a negative role in the development of the project approach and in the developing of students' attitude to it. They reflect the interpretation of the nature of projects by the teachers. Russian educational tradition plays its role in this. Historically, the dominant view has been that you have to base your activity on prior knowledge and skills. During the activity you can only improve on what you have already learned. Traditionally, a 'project' is considered as the final piece of work at university level. At school level, the word 'project' has not been used hitherto, so the nature of the university level piece of work has been extrapolated to the new form of learning at school level. Also, traditionally, the terms 'project' and 'projecting' mean designing on the paper, developing something

up till the stage of realisation. Thus, the whole concept of project-approach and project terminology are new to Russian teachers, and these difficulties have been highlighted during this study.

Students' answers demonstrate that they recognise the following factors which differentiate projects from exercises:

- 1 the structure – in the project there are several components or stages, in the exercise there is one part
- 2 the setting of the problem – in the exercise the teacher specifies the task, in the project students do what they want
- 3 the duration – projects last longer than the exercises
- 4 the emotional side – "Projects are more interesting", "The project is much more interesting", "Exercises are not interesting as you do not use your imagination".

But then, many students know only one possible way of using projects. They do not see important differences such as projects being oriented towards the real needs of people, whereas exercises are devised by teachers to teach particular areas of skill or knowledge.

Many students identified the main results of doing projects as the improvement of their making skills (47 out of 66), and 50 out of 66 said that projects influence their personal qualities. In a very few cases students mentioned the dual characteristics of designing and making. This indicates that teachers gave insufficient emphasis to design activity within projects.

The main steps identified for overcoming this problem are (a) a more detailed explanation of the nature of the projects, with (b) greater emphasis on human needs.

Humanisation and epistemology

The other issue is humanisation. This is a central aim of educational reform in Russia (see Yeltsin, 1992). Most of the Technology teachers interviewed identify humanisation as the process of student development, via projects, forgetting about the other side of humanisation - the orientation of the projects

to human needs. As mentioned above, students fail to see this as a significant difference between the projects and exercises. Teachers have to emphasise that the needs of people play a crucial role in the whole process of project realisation. Special attention should be paid for the investigation of peoples' opinions. In the higher classes (Classes 7-9, ages 14 -16) project themes with more social importance should be chosen. This goes beyond the framework of the official programme. Design-analysis needs to include the impact of the product on nature and society, as well as assessment as to how needs are met by this product.

In a very broad terms, the humanistic tradition is opposed to the engineering tradition, which has very strong roots in Russia. In Soviet times the engineering tradition was connected with the philosophy of technological determinism, which was part of marxist-leninist ideology. The development of the productive force was seen as the main factor which determines the historic process. Tools, equipment, machines and technical systems were counted as the leading elements in the development of the productive forces (see Frolov, (ed) 1987). Technology was considered as an applied science (the polytechnic principle at school appeared on this basis). Thus, on the theoretical level, there was a straight path from scientific knowledge to the technical device. In this paradigm there was a need to learn theory first and then apply it. Technology was not considered in a social context. This is in contrast to an humanistic approach, in which technology is seen as part of social development.

The important role of engineering tradition in the life of Russian society was related to the Russian educational tradition as a whole. This was rooted in the ideas of Comenius who believed that the students have to acquire as much knowledge as possible. (Comenius, 1967). This approach was developed in the tradition of rationalism, in which the process of learning was associated with systematic knowledge of the physical world. The abilities of logical thinking, deduction and abstract thinking, together with a systemic approach to understanding the world, were seen as the

aims of education. Knowledge about people (for example, of a person's opinion) was not considered as important. This lies at the root of the interpretation of the nature of the project approach.

This can be contrasted with the situation in Britain, where most science and technology educators hold a constructivist view concerning the acquisition of scientific knowledge (see, for example Millar and Osborne, 1998). The idea of technology as the application of science has been widely challenged (Layton, 1993; McCormick, 1997). Many authors see technological capability as reflecting a distinct form of knowledge, and support an 'interactionist' view of the relationship between science and technology (Gardner, 1994). The use of projects methods in teaching technology in Britain is predicated on both a different epistemology, and on a different approach to learning. It is not surprising that their use in Russia is exposing contradictions.

Summary and Conclusions

Questionnaires completed by students and follow-up interviews demonstrate that they like the project approach very much, and that it has a strong impact on their personality. Even this limited way of introducing projects opens the possibilities of different ways of learning, and freedom of choice. This is a very positive move in the 'right' direction and suggests strongly that the project has been successful. However, there are some deep, culturally rooted misinterpretations of the approach. These are reflected in the students' attitudes and understandings of design-based projects. Among them are:

- The attempt to teach *about* projects through theory *before* the actual projects starts, rather than work inductively from students' experience of projects.
- The attempts of individual teachers to use projects in the classroom in just one way. (eg, only open-ended tasks, so projects are not connected with the national curriculum at all, only using projects to sum up making skills already learned – in effect the projects are just another exercise, only using closed design briefs to teach very specific skills).

- The attempt to look on projects as a terminal exam (so the teacher can assess the student) but not as an important learning experience in themselves.
- Insufficient attempts at teaching of designing and making skills through projects (as well as in exercises).
- The attempt to demand very beautiful, over-presented design-folios from students (students have to re-draw and re-sketch the pages to make them really nice).
- Insufficient focus on human needs.
- Insufficient attempts to teach designing skills across a range of projects, or to use exercise to develop strategic design skills (see Pavlova and Pitt, (2000) for examples of such exercises).
- Insufficient use of mini-projects.
- Insufficient attempts to use group work.
- Confusion based on lack of agreed terminology.

These examples demonstrate a very strong didactic tradition based, on a linear, or step by step, approach to the acquisition of skills and knowledge, an epistemology in which practice should be based on theory, and fear of using projects in different ways (which demonstrates *either* that the teachers still do not feel confident enough *or* that they do not have the wider picture in their minds). Teachers need to understand the nature of project approach in depth, and to organise it in a way that opens up maximum opportunities. The cultural issues still need to be resolved.

This list of recommendations to improve practice could, perhaps, be applied to many schools in England. For over ten years the use of projects has been central to the way that technology is taught. Yet OFSTED reports still show that the teaching of designing is weaker than the teaching of making skills: there is a need for greater use of product analysis (OFSTED, 2000; Ive, 2000). Study of the relationship between technology and society is slowly entering the curriculum in England – it gets a mention or two in the new Order (DfEE & QCA, 1999) but in most schools it is not central to the way that the subject is taught. Perhaps the new guidelines for inspecting D&T departments will strengthen

teachers' resolve to take these issues more seriously (OFSTED, 1999). It is one of the authors' experience, as a field officer for Nuffield Design & Technology, that the problems identified in Nizhny Novgorod are very similar to those in schools in this country.

Yet something seems to be going right. Based on the experiences of the pilot schools in Nizhny Novgorod, the Ministry of Education of The Russian Federation is insisting that the use of projects should be at the centre of the way that Technology is taught (Leontieva, 1997, personal communication to authors). The teachers in Nizhny Novgorod are being asked to put together books of projects for use throughout Russia. Commercial publishers are keen to disseminate a new sort of Technology textbook and methodological books for pupils and teachers. There are still some members of the Ministry's expert committee on Technology education who hope that the subject will remain rooted in the transmission of prescribed knowledge and craft skills (personal communications to the authors). But it does look as though a design-based approach to technology might be acceptable in Russia.

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