Integrity in architects' education

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ABSTRACT: The goal of this article is to present the author's contribution to the process of ensuring there is integrity in architects' education. Integrity is an obvious requirement of education, as well as requiring an holistic approach to the transfer of knowledge shaping the professional skills of future engineers. But at the same time, the progress of technology causes the formation of new technical disciplines leading to the creation of new subjects, and finally to the atomisation of university teaching. Also, the system of teachers' assessment creates competition rather than co-operation, with unforeseen, destructive results. The research basis for the article is the author's observations made during the teaching in classes of Construction and Building Construction Systems in the Faculty of Architecture at Cracow University of Technology (CUT), Kraków, Poland. Presented in the article are examples of teaching materials and students' works made during these classes. Finally, the author points to both achievements and shortcomings of the implementation of teaching assumptions and imperatives into practical teaching.

INTRODUCTION

Technological development requires constant change in education, including engineering education. New scientific disciplines and new teaching subjects emerge. These new disciplines do not immediately find their place in university curricula. There is a quantitative growth (but not necessarily development) of the knowledge passed to students. An impact on integrity in knowledge and practice must be considered.

Figure 1: Sloped roof on the commune Mogilany near Krakow (Photograph by R. Marcinkowski, 2018).

Consider that sloped roofs are obligatory in many regions of Poland. There are discrepancies between regional urban requirements and educational institutions, which promote flat roofs as an *only esthetically proper* form for a house. This produces effects satisfying neither the architect nor the architecture department. An example is shown in Figure 1, but similar forms are present practically in all regions of Poland.

Consequences of Discrepancies in Knowledge

There are several negative side effects of knowledge offered to, and understood by, students, such as:

- repetition of knowledge on different courses and excessive (especially from the students' point of view) teaching hours;
- internal contradictions (real or apparent) between the knowledge proffered by different teachers;
- displacing important, but apparently *outdated* issues from the programme (such as the sloped roofs, presented more widely here).

These phenomena, discussed previously by the author [1], result from the insufficient integration of teaching or, more precisely, the lack of co-ordination between institutes.

The example shown in Figure 1, typical of contemporary dwelling architecture, demonstrates the problems concerning sloped roofs. The collision of two opposing ideas can be observed. Regional requirements concern usually the angle of the roof, minimum overhang or maximum distance from eaves to the ground. On the other hand, there is the simplicity and functionality of flat roofs. However, the relation between academic teaching and actual architecture is more complex than could be described in a few lines.

Architects educated about flat roofs are reluctant to comply with regional requirements. Even the fashionable timber-log houses look as if carpenters designed them rather than architects. In fact, most single-family buildings are built as so-called *ready projects*, which mean the designer had never seen the site nor met the future inhabitants. Problems concerning these traditional types of building have been discussed by the author [2][3].

RESEARCH BASIS

Observations and Experience Sharing

Observations presented in this article are based on classes conducted by the author in the Institute of Construction Design of the Faculty of Architecture at Cracow University of Technology (FA CUT). These classes are:

- Constructions for Polish students (semesters 3 and 4);
- Building Construction Systems (alternatively Building Surveying) for foreign students (semesters 3 to 8), according to the Erasmus Programme.

The semester includes 15 weekly classes, 90 minutes each. The total number of students in a semester is 60 to 80. The sharing of experience between teachers from various universities and at international conferences adds weight to the observations stated here.

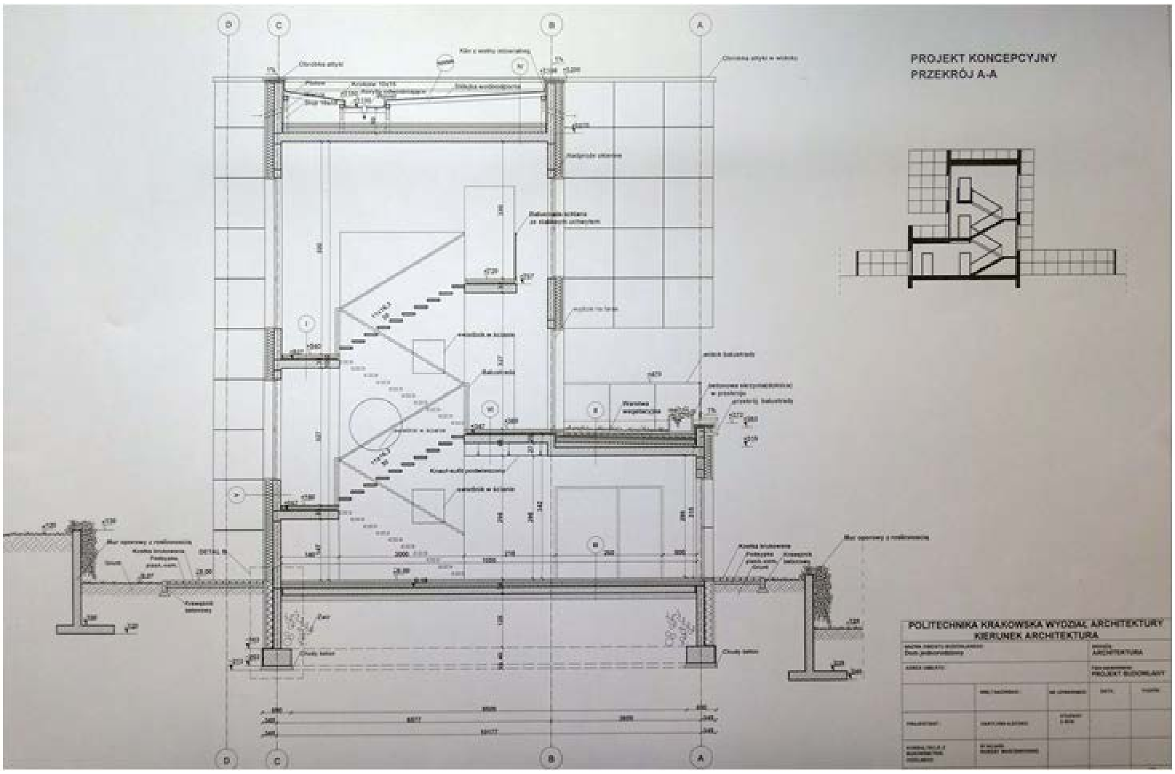

Figure 2: A vertical section of building based on a conceptual design. Student Vasylyna Ilechko, 2018.

Drawings (see Figures 2 to 7) are from classes conducted by the author. Student names are in the captions. In Figure 2, an example is shown of a successful project based on a previously finished conceptual design. The concept is in the upper right corner. Modularity of façades and architectural solutions were (mostly) preserved. However, there was no feedback between the conceptual and technical project phases.

CURRENT EFFORTS AT INTEGRATION

Issues in Conceptual Phases and Integrated Designs

Integrity means proper multilateral relations between institutes or, more precisely, relations between independent teams of teachers. The term, *integrity,* became important in numerous discussions between university teachers. The integrity of the process of education was also an important factor in the assessment of the Faculty by the Royal Institute of British Architects (RIBA) accreditation commission.

The current dominant position is that students should finish the conceptual phase of a project before starting work on technical solutions. In exhibitions of student work, most emphasis is put on construction projects based on a previous conceptual design, enabling comparisons and pointing to the continuity of the teaching process. An example, showing the conceptual leading to the technical stages of a project, is shown in Figure 2.

However, there is a serious problem with this approach. Many important issues of construction (structures, installations, and generally the technical aspects of design) are absent during the conceptual phase.

In the past, students have attempted to work on the same project in various institutes. The students were expected to better gain knowledge of issues related to a building by these concurrent projects. But in fact, most projects could alter as a result of late conceptual changes. This problem was pointed out elsewhere by the author [1].

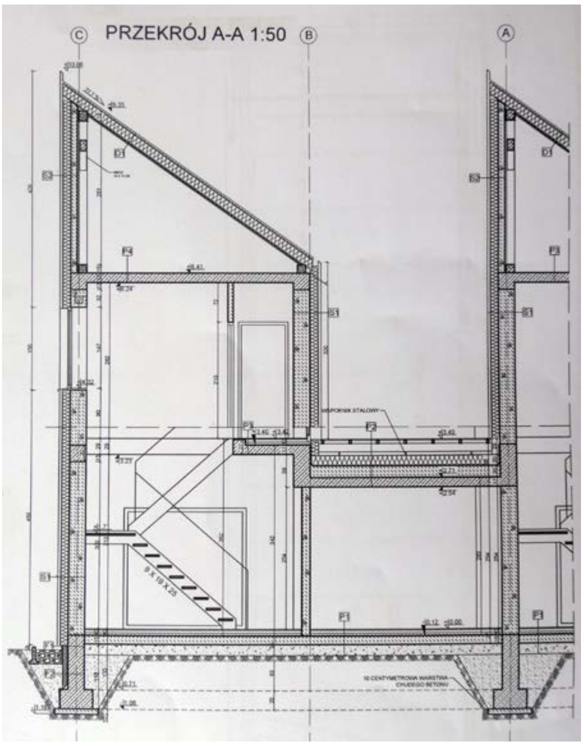

Figure 3: The vertical section of dwelling unit showing the non-rectangular geometry of a sloped roof. However, the attic space is not connected functionally with the rooms below. Student Dawid Zieliński, 2018.

The same problem applied to integrated designs, in which the teachers of various subjects or specialties were involved concurrently. The biggest benefit was that corrections could be made across different specialties at the same time. Theoretically, this gives students an opportunity to discuss their projects from many different points of view. There is still a problem of the *jumping centre of gravity,* which means that changes can be at the same time both justified and detrimental to different aspects of the same design. An example of such contradiction is an *economical, simple and cost effective,* but technically poor project, providing no chance for applying advanced solutions.

OTHER PROBLEMS WITH THE LACK OF INTEGRITY IN TEACHING

A Case of *Disintegrated Knowledge*

Steep roofs are obligatory in single family or small-scale building in the majority of villages and smaller cities of Poland. Therefore, a steep roofs project is significant: it could be an opportunity to integrate the subjects of structures, construction, history, geometry, and the functional and even philosophical aspects of architecture. This was pointed out by the author [4]. Unfortunately, the relationship between independent programmes of teaching caused the elimination of the subject from students' education. Thus, students are left with knowledge (in this case, the knowledge of construction) not related to other functional, structural nor general architectural issues (also see Figure 7). This serious defect of education is not a mistake of a separate teacher, but results from the lack of teaching integrity.

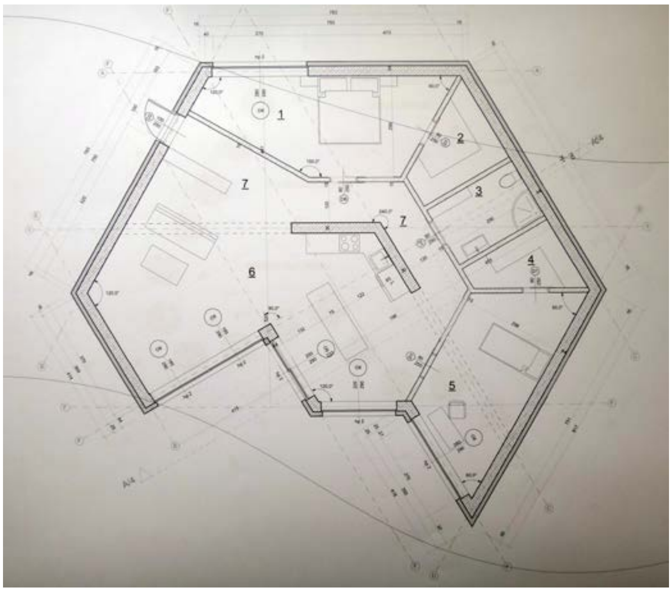

Figure 4: A non-rectangular ground floor plan of a building. The modular co-ordination and measuring are far more difficult than in the orthogonal type of building, because of modular axes in different directions. Student Sara Zawicka, 2018.

The problems of *disintegrated knowledge* can be illustrated by the following students' opinions:

- *Why should I study structures? What are structure engineers for?*
- *How could I design foundations? Foundations were done in semester 1.*
- *Why do you ask us questions of history (physics, geometry, etc) if we are now in the construction class?*

Such types of misunderstanding may be even funny, but can have a worrying effect. Students get the impression that specialist knowledge is not applicable to current projects, and therefore is useless. Unfortunately, with the non-integrated teaching process, this impression is difficult to avoid.

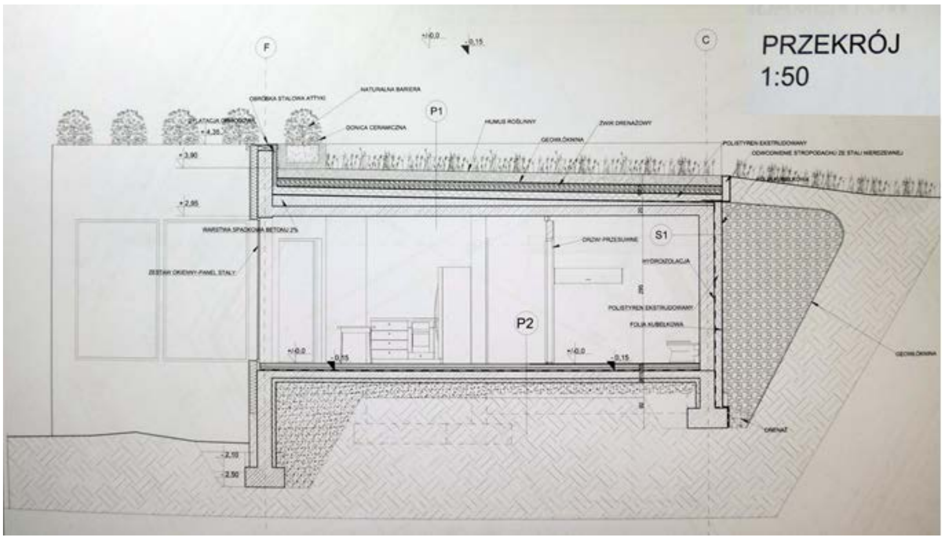

Figure 5: The vertical section of an underground house with the green roof accessible from the level of terrain. Student Sara Zawicka, 2018.

Another problem is the competitive assessment system of individual teachers as well as entire institutes, which hinders or excludes co-operation. With co-operation there could be success for all co-operating units. However, teachers at institutes are assessed separately. For teachers invited to co-operate, but awarded zero points, the effort put into such an integration is frustrating and unprofitable.

The *simple but poor* project causes also problems with assessment. How to evaluate for instance *constructionally* the project completely correct, but including none of the relevant constructional elements? Restrained or even an intentionally poor form of architecture can be its only value. But the constructional quality of projects depends on the complexity of the solution, and therefore should not be restricted.

THE AUTHOR'S PROPOSALS

New Standards Required

Some of the best works of architecture can be valuable as a form, but irrational as a structure. Other, structurally perfect, stay *not understood* as a form. For these reasons architecture belongs in the *kingdom* of art. But, the proper assessment of the same project by different academic disciplines requires some specific, new standards. The idea is to create a list of critteria important in both the conceptual and technical phases of a project.

Such a list of criteria, multilaterally approved, would not have to be completely satisfied by a student. For instance, the simple form of a building could be compensated for by additional study of another aspect of a design like the sunlight or car parking.

The list of proposals (below) have been discussed, but not officially implemented. It has a preliminary character and could be changed according to current needs or opinions. The important difference from previous approaches is that students are given more freedom and the constructional phase of work does not require the literal continuity of the conceptual project.

Proposals for Constructional Requirements for Projects

Below is a list of factors for improving projects:

- Situation of building on a sloped terrain: a slope of approximately 10% requires defining levels of gates, stairs or terraces.
- Situation of building not on the ground, such as on a roof of an underground structure, garage.
- Parking and car turning geometry (an example of supplementary task for student choice).
- The analysis of sunlight: timing of sun and shadow for façades of adjacent buildings (another supplementary task).
- Dimensioning of non-rectangular and/or curvilinear floor plans (example, Figure 4).
- Dimensioning of non-rectangular and/or curvilinear cross-section elements.
- Steep roofs and/or glazing with non-rectangular 3D geometry (examples, Figure 3 and Figure 6).
- Green terrace available from apartments, especially from the terrain (example, Figure 5).
- Structures with large spans: structural cantilevers, asymmetrical foundations.
- Staircases open to the interior, multilevel interiors.
- Daylight available from the upper floor.

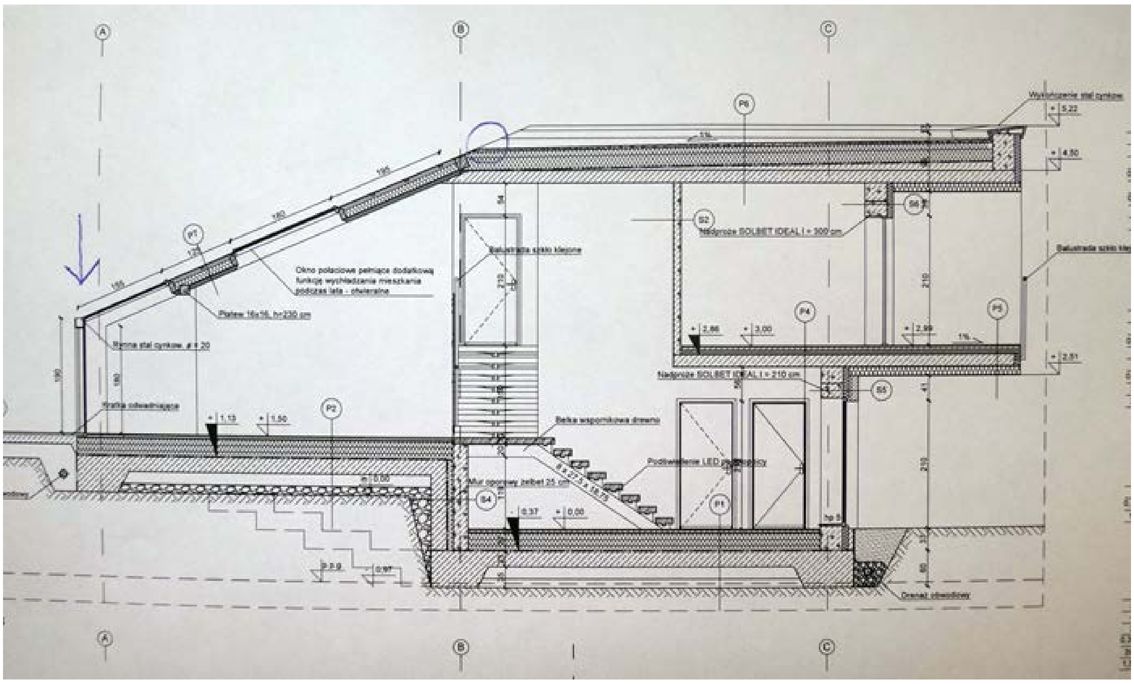

Figure 6: The vertical section of the single-family building. A lot of invention (sloped and flat roofs, semi-floors, staircases, balconies, foundations, etc) in spite of some technical mistakes. Student Wojciech Wojas, 2018.

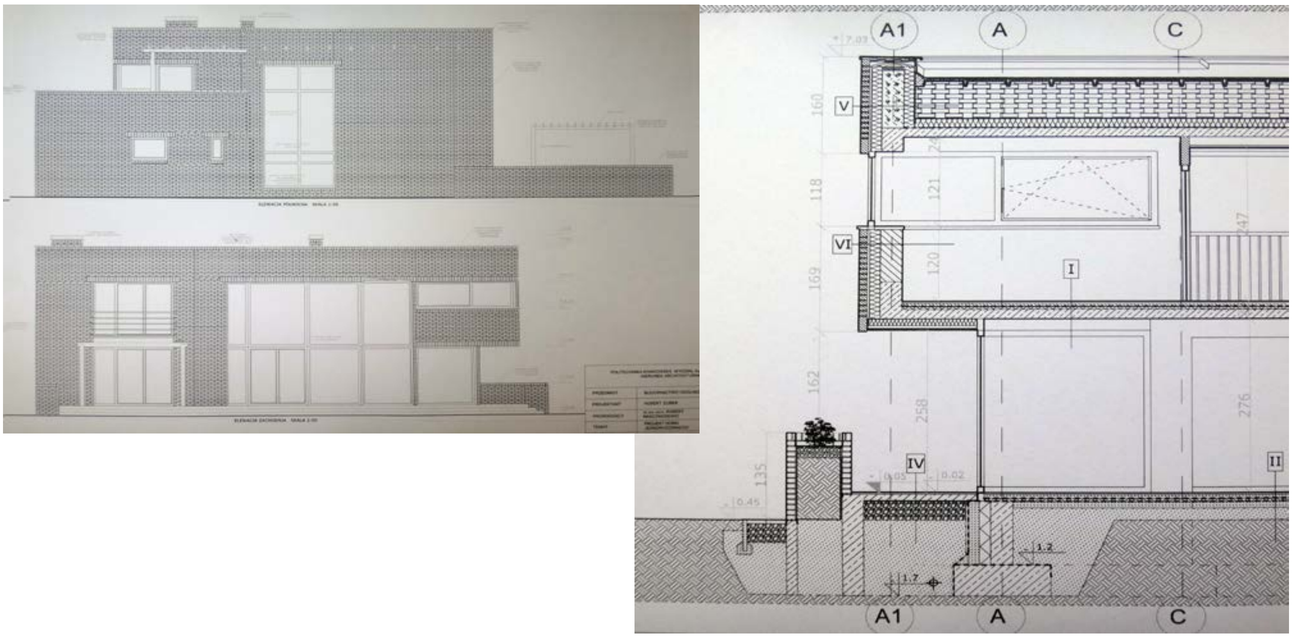

Figure 7: The façades and vertical section of a house. An attempt to include traditional masonry into modern dwelling architecture. The not-directly-visible problem is that the size of bricks in Poland (260 to 270 mm) does not fit any of the modular grids used as standards in architecture. Thus, brick façades often need individual solutions. Student Hubert Zuber, 2018.

CONCLUSIONS

The author has aimed here to contribute to the debate on integrity in architects' education. As well as integrity in education, there is a need to be holistic in transferring knowledge and skills to future engineers, especially in the face of technological changes. Inevitably these forces create new subjects, and therefore a consequent risk to university teaching. With competition resulting from teachers' assessment, the preferable aspect of co-operation could be replaced by less-desirable and unknown consequences. In this article, the achievements and shortcomings of implementing teaching assumptions and imperatives into practical teaching were outlined.

Listed below are relevant points to inform the debate on integrity:

a) Architectural workshops, both domestic and international, can be important for cross-curricular integration. Quick and effective holistic teaching means the teaching is not broken down into separate dissimilar items.
b) The need for integrity in engineering education is widely recognised, but not widely implemented.
c) The specialisation (or rather the atomisation) of teaching causes the situation in which many students can succeed at the educational process without addressing other important issues. A typical example is implementation of steep roofs in contemporary dwelling architecture.
d) Students given freedom, work better. They do not find the course of construction as only a repetition of conceptual projects, but rather as field for extrapolation of knowledge and discoveries.
e) The idea that a constructional project is only a repetition of the conceptual version leads to unenviable dychotomies. However, these dychotomies can be overcome, thanks to the evaluation criteria.

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