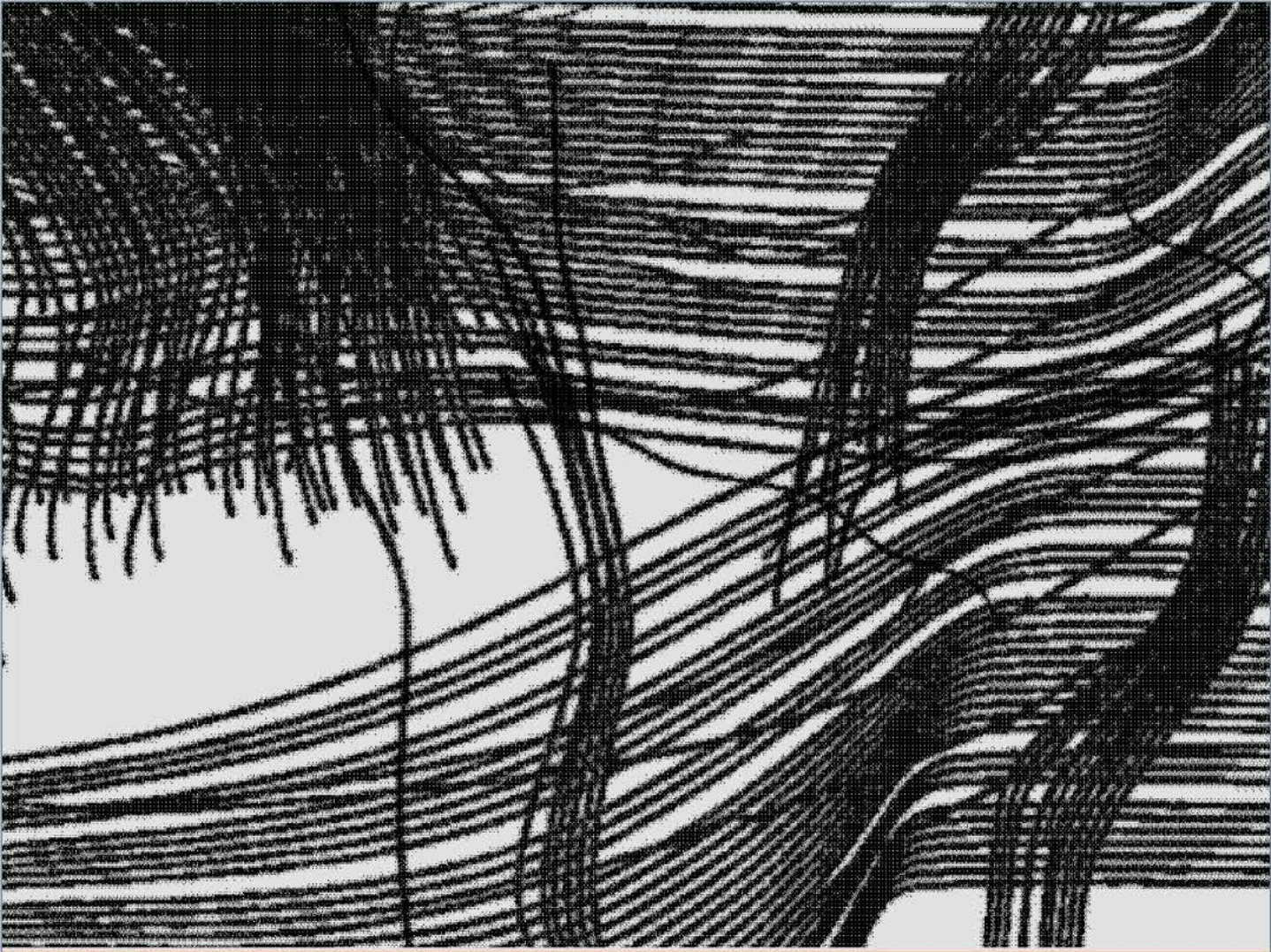

Textiles, Identity and Innovation

IN TOUCH

EDITORS
GIANNI MONTAGNA
CRISTINA CARVALHO

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Textiles, Identity and Innovation: In Touch – Montagna & Carvalho (eds)

Experimental processes of knowledge exchange for knitwear design

M. Motta
School of Design, Politecnico di Milano, Italy

ABSTRACT: Knitwear is an area of growing interest for fashion and textile designers that goes far beyond artistic creation, as it deals with the complexity of peculiar realization techniques and with a very articulated industrial sector. What can scientific research do in the field to make young knitwear designers closer to the knitwear industry, and to answer effectively the needs of such a specific sector? This paper describes the premises, the undertaken actions, and the results of an experimental research-teaching activity held in the School of Design, at Politecnico di Milano, in collaboration with Ghioldi, an Italian printing and knitting company. Part of a wider doctoral study, the reported experience puts in touch pure creativity with manufacturing processes, university with industry, and the knitwear field with the textile printing field, serving the aim of improving the knowledge exchange through and towards design-driven innovation in processes, products, and teaching methods.

1 INTRODUCTION

The current paper addresses in detail an experimental teaching activity conducted as a pilot action in the scope of a wider doctoral research, with a double focus on the definition of methodological groundwork for teaching knitwear design, and on the pursuit of innovation at an entrepreneurial and scientific level.

Although the description of the entire research work goes beyond the purpose of this paper, it nonetheless constitutes the background knowledge on which the experimentation here described is based: some words must therefore be spent talking about the main issues it intended to address, and the collected findings that allowed the experimental phase – of which the focus of this paper is part.

2 A WIDER RESEARCH WORK: OVERVIEW

The mentioned doctoral work it set among the academic discourse on fashion design as part of the ongoing industrial design culture (Bertola, 2007) at Politecnico di Milano, focusing on the specific area of knitwear design (KD). This specific are represents today a peculiar ground of industrial experimentation and a complex field to address (Conti, 2016), with its long and fragmented production chain made of many different stakeholders, namely, spinners, knitwear factories, brands, certification bodies, and machine producers. This complexity leads to a great waste of time, resources and materials, and leaves a low budget for the training of new designers and for knowledge transfer inside companies. Nonetheless, in an industrial scenario that is continuously renewing itself, the concrete need to train new professionals is increasingly urgent – professional that are able to innovate processes while keeping the eye on the traditional work from where this industry originated (Affinito et al. 2017), to act therefore in between tradition and innovation, creativity and technique.

These were the premises behind the decision to address the complexity of the knitwear industry from the educational perspective, investigating the kind of competencies a well-prepared professional should have in order to respond to the needs of the industrial context.

Due to the presence of very little literature and scientific research about the knitwear field (Eckert, 1997), the first phase of the study aimed to frame the state-of-the-art and to build new knowledge that is useful to then intervene with impacting experimental actions. This preliminary phase addressed knitwear both as an industrial system and as a discipline taught inside design universities. The collected findings led to two main issues, which constituted the ground for the following experimental phases of research: first, in knitwear design there can be no creation without a technical background, as knitwear is not just a creative exercise but a technique, and the knowledge of designers has thus to be creative, cultural and technical to effectively interact with a so articulated industrial structure (Penati, 2000 & Dell'Acqua, 2007). Second, there is a belief – in the industry as well as in academia – that industry and university should be more deeply connected: in this perspective, innovative ways of relationship between these contexts should be experimented.

The general aim of this research was thus to codify a teaching strategy for knitwear design, by experimenting, building, and systematizing the exchange of knowledge between university and companies, in order to address the specific needs of the industry and fill the

existing gaps of knowledge inside universities. This brings benefits, on one side, for students, researchers, and professors, and on the other, for professionals, managers, and the whole business environment.

Didactic activities were the tool used to pursue this result through two subsequent experimental phases. The first phase of experimentation – consisting of 8 teaching activities – was useful to design, apply and verify a framework for KD teaching, containing actions, subjects and tools to be used according to different timelines and settings, to the number of participants and their background, and to the presence or absence of a company (Figure 1).

Given the first results of the participation of companies in the teaching activities, which outlined the recognized additional value of their contribution to diverse areas of knowledge, the second phase aimed to experiment new ways of collaborative teaching, exploiting the variety of stakeholders along the chain. This phase consisted of four more didactic pilot activities and included the object of this paper. The intent was to go beyond the most common practices: for example, of **sponsorships**, which add little knowledge to the one owned; **traineeships**, which are highly detached from the educational environment; **contests**, where usually selected students compete individually with spectacular designs and no clue of industrial dynamics; **workshops**, which, although being valuable didactic exercises, often see the participation of professionals in a very short and concentrated amount of time.

Moreover, all the earlier phases of the research—literature search, interviews, and applied research—highlighted some shortcomings for the existing collaborations. For each one of the detected issues I assumed a response to experiment with during the pilot activities. (Figure 2)

The present paper focuses on one of the four undertaken pilots, which involved eight 3rd-year students attending the Fashion Design Study at the

Figure 1. Overview of the framework. The three tracks and the contained modules compose the ideal didactic experience for KD. Arrows highlight the impact of each module on the others.

ACTUAL SHORTCOMINGS	EXPERIMENTAL ANSWERS
Short time dedicated by the company to the students	Longer times
Briefs which simulate reality but are not actually real	Reality-based brief addressing the real needs of the company
Loose relationship and few meetings with the experts from the company	Constant feedbacks from companies on design and product development
Lessons held inside classrooms or workshops with inadequate facilities	Students immersed in the industrial environment to develop part of their work
Exclusive dialogue with the design units, with no contact for students with the other stakeholders along the chain	Closeness to manufacture with the involvement of diverse stakeholders
Lack of technical knowledge transferred, due to a preference for the creative side of the project	Collaborative development of student's projects with expert technicians inside companies
Difficulty for companies to understand and reach concrete benefits that they could exploit on everyday work life	Pursuing of concrete benefits for the companies as well as for students and HEIs

Figure 2. Summary of the actual shortcomings of cooperation between the industry and Higher Education Institutions in the field of KD, and the corresponding answers experimented with in the pilot activities.

Politecnico di Milano, School of Design, and a small company named Ghioldi. The aim of the paper is to describe it in detail and to stress its peculiarities, which are object of particular interest for the author and might be of interest also for the themes of the D-Tex 2019 conference.

The activity analysed in this paper, indeed, worked on border areas between multiple elements, such as the company and the university, knitwear and printing, manufacture and pure creativity – and created not only contacts between them, but an actual exchange of knowledge through and towards design-driven innovation on processes, products, and teaching methods in the field of textile design.

3 AN EXPERIMENTAL PILOT ACTION

3.1 *Premise: Peculiarities of the case and valuable assets for successful cooperation*

Ghioldi is a company with a particular reality, specialized in high-quality printing, based in Appiano Gentile, in the textile-silk district of Como. When its clients began asking for printed knitwear they understood that, due to the complexity of knitwear structures, the need for specific technical competences in the field (Eckert, 1997, Traini, 2004, Frisa and Danese, 2011) was so crucial that they had to dedicate an entire unit to knitwear development. Ghioldi entered the world of knitwear, acting as a link between high-end national and international fashion brands and the knitting manufacturers in the Italian territory, and delivering this service with the role of consultant that can take charge of programming and controlling all the phases of product development. Clients started to rely on Ghioldi not just for printed knitwear but for the development of knitted products in general, and the unit rapidly began acting on an almost independent track, parallel to that of printing.

Currently, Ghioldi has the need to recombine its strong printing side with the youngest knitwear unit,

finding new solutions to innovate the printing techniques applied on knitted backgrounds.

When we, as researchers and teachers in the knitwear design course at Politecnico di Milano, kept in touch with Ghioldi, we saw a good opportunity to build a relationship that could satisfy the needs of the company, giving at the same time benefits to students, and being experimentation ground for the ongoing research activity.

One notable thing was the ability of Ghioldi in seeing in the cooperation with students an opportunity for innovation rather than a waste of time. They understood that in the university context they could find new ways of experimentation that were inaccessible inside of a company, always taken by the pressure of clients and in search for fresh minds and ideas. We proposed them to actively undertake a role in teaching. Our purpose was to understand the practical need of the company and to translate this need into a teaching experience.

We undertook the task, with multiple objectives in mind:

- To reach the will expressed by the company to reconnect printing and knitting in innovative ways;
- To train students, widening their knowledge about both familiar and unexplored areas;
- To deepen the ongoing research: at the time I had designed the framework and I was looking for new perspectives on collaborative teaching in the knitwear field.

3.2 *Description*

To pursue the fixed objectives, the activity was structured as an immersive experience including all the experimental features outlined in Figure 2, further explained below and used as a reference list to describe what was done.

Longer times. The experiences lasted 3 months, with the launch of the brief in mid-April, and graduation in July 2018. This longer and articulated activity allowed a more intense deepening on each project.

Reality-based brief addressing the needs of the company. The brief, reported below as given by the company, moved away from the classic themes of traditional printed silks, and was provided to each student to be reinterpreted with a young and contemporary sensitivity through the technical knowledge on knitwear they had acquired during their study path. Ghioldi selected the classical themes of the winter season with the intention of presenting the projects at Première Vision in Paris, in September 2018; this added another element of connection with reality.

The design brief was: *'With the assigned theme each student will design a capsule collection and realize one or two prototypes giving them a contemporary perspective. The identified themes are: Tartan, Animalier, Heraldic, Carpets, Paisley, Male textiles, Winter flowers, Graphic/Optical. Recurrent in textile/manufacturing archives, they are part of the common jargon of this sector and cyclically return every season reassuring consumers, but they must be continually reinvented without being distorted.'*

Constant feedback from the company on design and product development. The eight students developed their own project with periodic reviews with teachers and with a constant feedback by Marta Santambrogio and Francesco Lana, from Ghioldi, on the design part, and with Marco Ghioldi to work on technical solutions and to collect information about the printing techniques they aimed to use. This happened in a continuous consultation with teachers, to ensure an effective cooperation on the educational side.

Immersion in the industrial environment. During the three months that the activity took place, students had the opportunity to observe and be hands-on with the manufacturing processes inside the company: Ghioldi welcomed students, scheduling appointments from time to time to avoid congested days of work for big clients, to ensure that machinery was free to be used, and to dedicate the right amount of time and energy to students. Through this, students got concrete help towards the experiential learning of new knowledge about printing.

Closeness to manufacture. The peculiar asset of a company as Ghioldi, which has a long history as a printing manufacture in one of the most traditional Italian districts, having the courage to innovate in the completely different field of knitwear made the students immersed in the industrial environment, working side-by-side with creative figures and with technicians in all the phases of the realization of their prototypes. Students also experienced a new kind of creativity, typical of small manufacturing companies, explained here with the words of Marta Santambrogio, head of research at Ghioldi, to the students:

'There is always someone who "thinks and does," which is Design. There's a world outside of the style offices, beside these unidentified sheds, and it's where everything happens. Creativity on paper is one thing, problem-solving creativity is different: the client has given me a design, how do I solve it at the production level? We test, improvise solutions and it is the kind of creativity that I prefer, because it is about solving a creative problem in a creative way.'

Collaborative development of the students' project with expert technicians inside the company. Students went through the design process of knitwear, acquired in the earlier semester and started to experiment and prototype their ideas; they developed the swatches with knit stitches and structures, selected the final yarns, and did homemade trials of printing to define in detail the aspect and the colours. Students worked mainly on the

knit part at the university with knitting machines, under the supervision of teachers and technicians. In addition, the majority of the trials with printing were done at Ghioldi, where students were taught to understand whether digital printing or screen printing was necessary, depending on the yarns they used, the coverage they wanted to reach with colour, and the thickness of the underlying fabric. This process required several trials; in some cases, structures had to be modified to privilege printing or even to make it feasible, while in some others, printing solutions have been adapted to the knits. Once the sampling phase was complete, the students realised all the parts of the final garments at Politecnico di Milano, and, before sewing them, went to Ghioldi to print.

Pursuing concrete benefits for the participants. Students knew Ghioldi's reality first-hand and learnt to deal with it. At the same time, they could access facilities outside the university and directly dialogue with experts to enhance both technical and creative skills. The final presentation of their projects at Première Vision, will concretely speed up their entrance into the labor market and increase the visibility for their work.

Ghioldi had access to up-to-date knowledge and to fresh ideas to develop innovation, while getting in direct contact with students before any job interview, which means that the company had the opportunity to model new professionals towards their own needs. In addition, the company gained visibility among stakeholders of the sector through the exhibition of the students' work.

Researchers and teachers had the opportunity to experiment up-to-date teaching tools and methods in the field and to improve their entrepreneurial competencies with a business connected problem-based approach. In addition, they could overcome shortcomings which usually affect Higher Education Institutions concerning materials and facilities.

3.3 *Outcome example: 'Breaking the grid'*

Through an extract of the Thesis booklet, here I give a brief overview of '*Breaking the Grid*' by Margherita Baggio, one of the eight realised projects. Baggio worked by experimenting with knitwear structures and with the meanings of printed motifs, approaching them firstly from a design perspective, and later from a technical perspective.

After the preliminary research on the classic theme of Scottish Tartan, with highlights on its history and symbolic meanings, the project provided a translation of the traditional check motifs in the contemporary society, using distortion to intervene on its rigorous lines (Figure 1). The design process went on with the definition stitches (Figure 4) and the design of a capsule collection with figurines (Figure 6), technical sheets (Figure 7), and printing

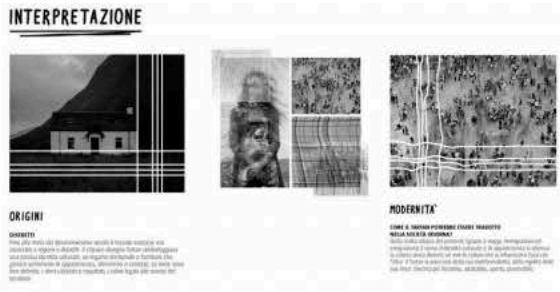

Figure 3. *Breaking the grid.* concept and mood board.

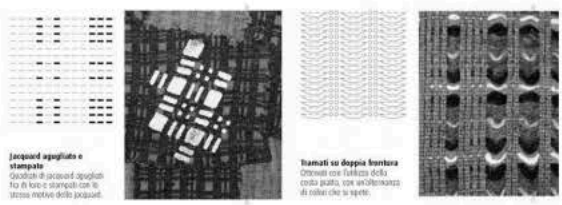

Figure 4. *Breaking the grid.* study on stitches.

Figure 5. *Breaking the grid.* selection and features of yarns.

Figure 6. *Breaking the grid.* collection outline.

experiments (Figures 8, 9), presented here with the undertaken technical solutions. In the end, the outfit was presented with the shooting (Figure 10).

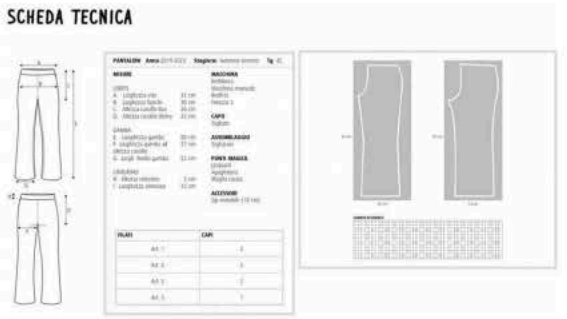

Figure 7. *Breaking the grid.* example of technical sheet.

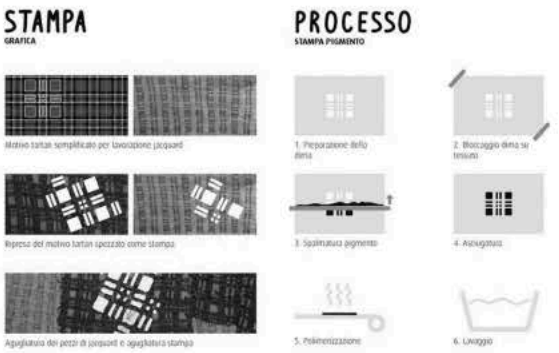

Figure 8. *Breaking the grid.* study on the print and printing process.

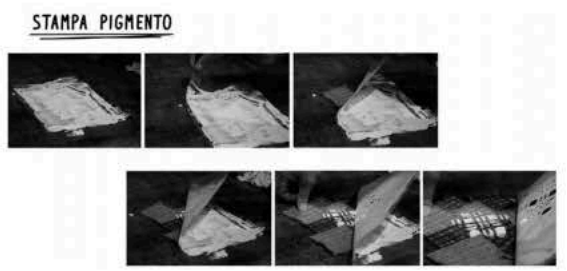

Figure 9. *Breaking the grid.* printing.

Figure 10. *Breaking the grid.* final photoshoot.

4 CONCLUSIONS

The analysis of the reached outcomes showed satisfying results and can be declared successful in terms of its final product and presentation. The interest of this study is, therefore, to enhance the quality and the areas of knowledge learnt by students, to accelerate their integration with the working reality, as well as to answer specific needs of the company we worked with.

'The thing I liked the most has been to enter the world of printing while maintaining my inclination towards knit design. In Ghioldi I have been able to dialogue with experts and to put my knit abilities—even if I know they still have to improve—together with their expertise on printing to reach something unexpected' (Student A, June 2018).

The words collected from one student highlight the main benefit detected for this pilot: working with two fields and two techniques at the same time, knitwear and printing, while opening their eyes on the new world of printing, widened their perspective on what they already knew about knitwear – sometimes even threatening it.

They learnt, by doing, that a lot of the properties they used to consider as positive in knitwear, when dealing with printing on a knitted fabric become problems to be solved, or, in other words, criticalities to be addressed with design-thinking. They learnt, for example, that some processing operations and some washes, which are good to fix colours, could be dangerous for knitted yarns like wool, as they can felt or corrode it; that some colours do not give the desired effect on hairy yarns; that printing on a common piece of knitwear, maybe a sleeve or a back, which they proudly shaped, is not so easy to be placed and should be done on a rectangular piece of fabric to be cut-and-sewn only later.

Another beneficial result for students is that they were led to experiment in a quite autonomous way with knitted structures and to take complete charge of what they were doing when they went to propose it to Ghioldi. There, they learnt how to discuss their choices in a professional way and to establish a constructive dialogue which was more similar to an exchange of knowledge than to a trainer/observer relationship. In this perspective, they worked mainly towards the development of innovative structures of the knitted fabric – they stressed the owned knowledge – to make them interact with the overlaid printing – and added new one.

The continuous dialogue with the company experts was useful on two levels: first, it guided them towards a contemporary concept, in line with the purpose of the market and promising concerning the possible development of creative ideas. Second, it led them towards an industrial way of thinking, firstly in terms of feasibility with the available technologies, and secondly in terms of costs and

production times, to reach a reality-based, concrete result which would have been useful for the company not just as an inspiration but also as a product to be exposed and communicated.

The added value of this pilot activity is shown by all the involved participants and pursued the initial objectives:

- It addressed the concrete need of Ghioldi, giving them fresh ideas to be presented to their clients – respecting the intellectual property of the projects, owned by students – at Première Vision, in September 2018. Ghioldi gave good feedback and expressed the will to make the cooperation continuous during the next Academic Years.
- It trained students, widening their knowledge about knitwear and creating new one about printing, plus training their minds towards the reality of industry, manufacture, and professional relationships.
- It drove the ongoing research towards its final result: it verified the effectiveness of the delivered knowledge with the designed framework and it was crucial to define guidelines for collaborative teaching. The two components led to a scalable teaching strategy designed, on one side, to respond to the needs of the industry, and, on the other, to provide teachers and researchers with the tools to foresee the expected result of any teaching activity and to manage it from a methodological point of view, to make it as effective as possible. This means that, depending on the request made by the stakeholder/s, teahers and researchers could undertake an activity of an entrepreneurial nature, using teaching as a verification tool and choosing the most suitable methods and their application towards the desired result, according to the students' background and the available time and facilities.

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